AMERICAN MACHINIST

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ENTERED AT POST OFFICE, NEW YORK, AS SECOND CLASS MATTER.

Kingsford's Improved Land Excavator.

We present herewith an engraving representing the recently improved land excavator, or steam shovel, manufactured at the Kingsford Foundry and Machine Works, Oswego, N. Y. This excavator is designed for any kind of land excavating, such as railway construction, &c., and is adapted to work in any kind of material that can be removed by a machine of this class.

The machinery is mounted on a strong frame, made of white Canadian oak, rigidly framed and held together by iron straps, bolts and shoes. The length of this frame is, from the rear side of forward jack timber to the rear end of cab, 26 feet. The width, from outside to outside of bed timbers, is 7 feet 4," and the extreme width of cab is 11 feet 6". The frame is mounted on axles carrying 30" truck wheels, the gauge of which, unless otherwise ordered, is 4 feet 8½ inches. Of these axles the front one is 5" and the rear one 5¼" inches in diameter. Upon these wheels the machine is propelled either forward or backward, by means of cable chains 1¼ inches in diameter, which take hold of suitable wheels on each axle, thus providing for driving from all four wheels, by which heavy inclines may be mounted.

To put the propelling device in operation it is only necessary to shift a clutch on the swinging shaft. The machine stands, and is moved, on sectional portable track, of which fourteen sections accompany each machine.

While at work the wheels are relieved of the weight and strain of the machinery by means of four jack-screws, each 4½ inches in diameter, and 4 feet 6 inches in length, working in nuts bushed with bronze. These screws are situated at the ends of two jack timbers, one forward and the other back, and respectively 16" × 16" and 15" × 15" in cross section. This not only relieves the axles and wheels of the strains incident to working, but provides the necessary base to insure stability in digging and swinging. The jack timbers are securely held to the main framing by means of heavy iron gripes and bolts.

The top of the crane is 23 feet above the track. The main timbers of the crane are 22 feet in length, and the dipper handle timbers are 13 feet in length.

The crane works and swings on a hollow cast-iron post, the weight of which is 700 pounds. The bottom of this post is flanged to the front frame and jack timbers, and is further secured to these timbers by heavy wrought iron clamps. The top of the post is secured by wrought iron braces, which extend back to near the center of the framing, lengthwise, where they are fastened to the main fore and aft timbers by means of suitable castings. These braces are in section 3½ × 5 inches. On this post the crane is swung by two ⅞" cable chains, extending from a second drum to each side of a turntable at the foot of the crane.

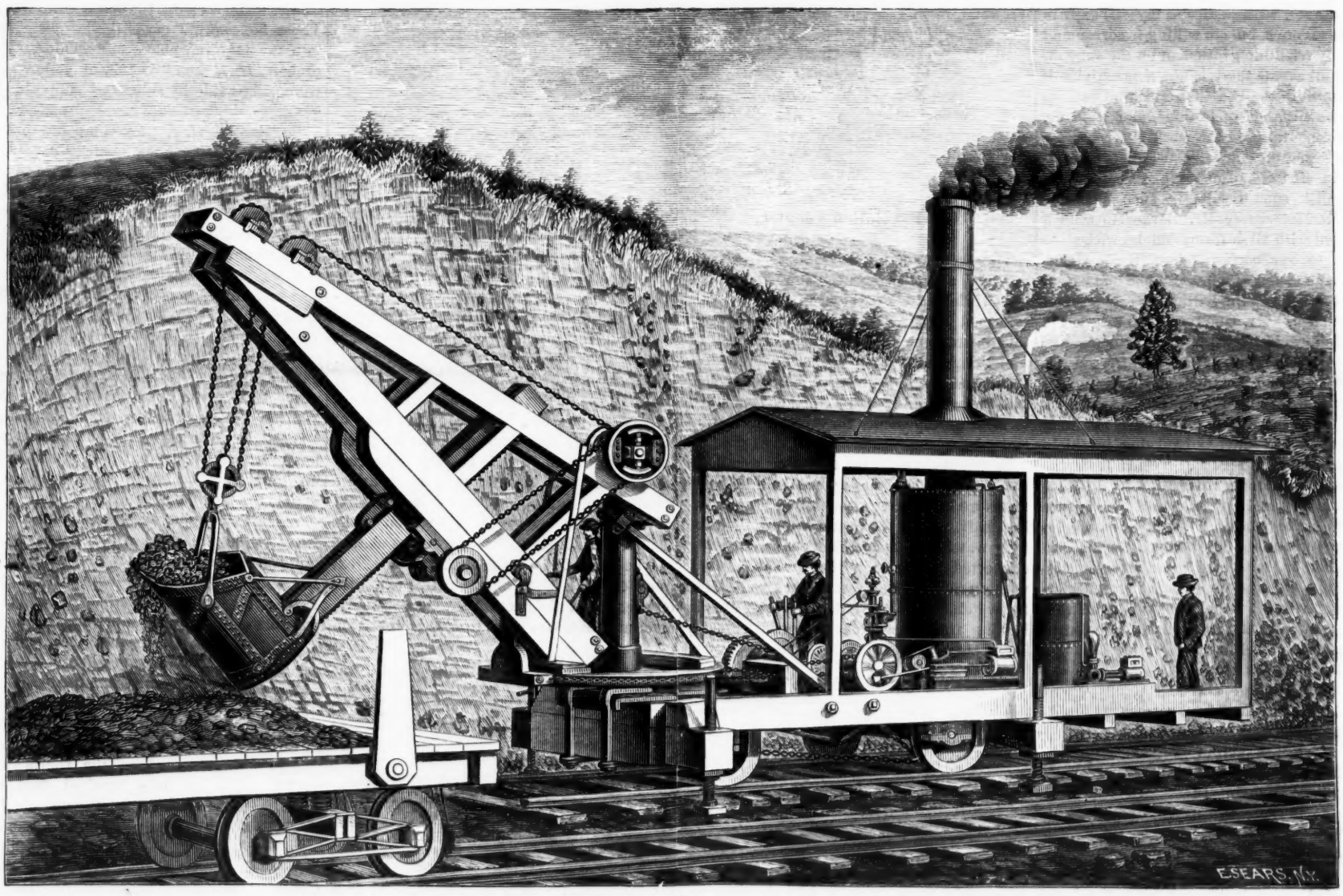
The hoisting chain, 1⅛ inches in diameter, extends from the hoisting drum to the inside of the crane post, and from there over suitably arranged sheaves to the dipper.

The dipper handle is moved by racks and pinions, and is provided with a friction thrust for holding the dipper to its work in digging.

The clutches by which the various parts of the machinery are put into operation are of the kind known as Alger's expansive friction. By their use the load is taken hold of gradually, thus obviating the danger of breakage incident to the use of a positive clutch.

The boiler is vertical tubular, 54" in diameter and 8 feet 6" in height. The engines are two, of 15 horse power each, geared down so as to insure a lift of 40 tons.

This machine is said to dig from 1,000 to 2,000 cubic yards per day of 10 hours (according to material) and to require the services of three men; the consumption of coal being about 800 pounds. The swinging friction shells, all pinions and the dipper handle racks are of cast steel. 800 lbs. of bronze are used for boxes, bushings, &c. The shipping weight of the machine is about 48 tons.



IMPROVED LAND EXCAVATOR.

A warm friend and valued correspondent of the AMERICAN MACHINIST writes from a New England city, that a manufacturer of that city, whose card he encloses, wonders whether the notices of manufacturing enterprises which appear under the heading "Manufactures" in our columns, are gratis, or if not, on what terms? Likewise we are very frequently asked by manufacturers and inventors of new mechanical improvements what charge, if any, we make for illustrated descriptions of such devices in our reading columns. To all such inquirers we will simply state that as journalists we are always glad to publish mechanical news, either with or without engravings, as occasion may require. We will further add that our object in such publication is not to benefit the manufacturer or inventor, but to benefit our readers, by adding to their stock of mechanical information. That such publication will also in all probability greatly benefit the manufacturer or inventor, is not our concern. The only other point which we wish

to have well understood is that manufacturers and inventors, who have something new to show our readers, may assure themselves that its illustration in our reading columns will not involve any business obligation whatever upon their part.

New Hardening Process for Steel.

A short time since, James H. Barker, of Deer Isle, Me., wrote us as follows:

"I would call your attention to my new process of hardening steel without the use of water, oil, or any composition or paste whatever.

"My business is manufacturing curriers' blades, sizes from ¼ inch to 2 inches in width, 11¼ inches long, and Nos. 19, 20, 21, and 24 gauge. The blades come out perfectly straight, and hard as glass—not a crook or twist in them. I discovered this process about two years ago, and have used it in my business ever since. This new process for saw manufacturers would be very beneficial, for it would save them gallons of oil in a year and do away with a large amount of hammering. It will also harden thick steel, by the proper machinery.

"I cannot, with justice to myself, explain how this is done, but am willing to correspond with any scientific gentleman on the subject.

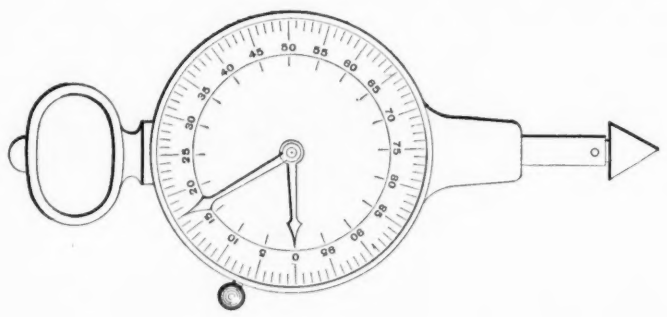
"At all events there is not a machinist or blacksmith in the United States that can explain how the thing is done, and it is the most simple thing in the world."

We were, of course, considerably interested in a steel-hardening process that will accomplish such results in such a simple way, therefore wrote Mr. Barker to send a specimen with all information he wished to impart to our correspondent, S. W. Goodyear, Waterbury, Conn., who has had extensive experience in the hardening and tempering of steel. Mr. Goodyear recently wrote us as follows in regard to the matter:

"I am in receipt of a letter from J. H. Barker referring to, but not explaining, his new process, and by the same mail I received from him a hardened blade over 11" long and about 1¾" wide, and varying in thickness from .041" to .043". Tested from the surface this blade seems very hard. Judging from the blistered appearance of the surface it had been very hot, not much below a scintillating condition. Tested for the straightness claimed, it seemed quite straight flatwise, but edgewise it was sprung considerably. Testing it for elasticity I found that an amount of deflection of not one-fourth what a piece of well hardened steel of this thickness should stand and come back straight as before, had given this 'new process' steel a permanent bend of more than an eighth of an inch. In springing it there was a crackling sound emitted, similar to that produced by bending tin. I now proceeded to break this wonderful specimen in order that the hidden mysteries might stand revealed. To break it was not difficult. If the intention had been to show the bad effect upon steel of too much heat in hardening, the 'new process' had succeeded admirably. If, on the other hand, it had been the intention to so harden a piece of steel that, judged by its strength and the character of fracture, it should appear to be in good condition for any tool requiring tenacity, good cutting qualities and durability, it could hardly have been a more lamentable failure. But why should I try to point out the defects when they can speak for themselves? Enclosed you will find a piece of the blade. Please examine the surface and fracture, and test it by breaking.

"If there were a way of hardening steel by which the tendency to spring would be entirely overcome, it would be entitled to the name Mr Barker gives it—'discovery.' I venture to say, however, that he cannot set aside any of the laws which govern the process of hardening, and if he heats the steel (which I presume he does, as he does not disclaim the use of fire in addition to oil and water) it will many times spring in the fire from the heating of one side or one edge faster than the other; or if heated ever so evenly, the steel may have been subjected to more hammering or tension on one side than on the other, in which case the heating, by relieving the tension, allows the steel to spring. There is a patent process which I have seen in operation for hardening strips of sheet steel, in which the cooling is done between two revolving cylinders which are kept cold by the passage of cold water through them. No oil or water is used to dip in, but it is evident that the same cause produces the hardness as when the steel is heated and plunged in water or oil, *i. e.*, sudden cooling from a right degree of heat."

We will only add that the piece of steel received by us showed on the broken edge a very irregular texture or grain, and was warped or sprung out of truth. Perhaps, however, it is not wholly fair to judge the process by a single sample.



New Revolution Counter.

The accompanying engraving represents, full size, a speed indicator, the invention of W. G. Richards, Providence, R. I. We are informed by Mr. Richards that he devised this instrument to meet his own need of something better than the ordinary instrument used for this purpose, and being well satisfied with its operation, he has concluded to make arrangements for their manufacture and sale.

In this instrument the actuating spindle is free from the registering mechanism; it can therefore be placed in contact with a revolving shaft, and as the operator notes the time by a watch, the mechanism can be instantly connected by means of the stud at the side, without the operator removing his eye from the watch. This prevents the loss of time in looking from the watch to the instrument, which introduces an error into the observations made with the ordinary speed indicator.

At the expiration of one or more minutes, the instrument can be instantly removed from contact with the shaft, when the revolutions will be found recorded; each space in the inner graduated circle representing 100 revolutions, and each space on the outer circle representing one revolution.

As the spindle is already in motion when the registering parts are connected, there is less tendency to slip; and to further guard against this, the actuating spindle is provided with a universal joint, so that, should the instrument not be held exactly in line with the shaft, which is not at all times easy of accomplishment, the result will not be in the least affected thereby.

After the revolutions are counted, the instrument can at once be set at zero, by disconnecting the recording mechanism, thus avoiding the necessity of turning back by hand.

One hundred revolutions of the spindle equal one of the outer graduated circle, and two thousand revolutions of the spindle equal one revolution on the inner circle; therefore it registers two thousand revolutions before repeating.

The extreme length of the instrument is only 3½ inches, making it convenient to carry around.

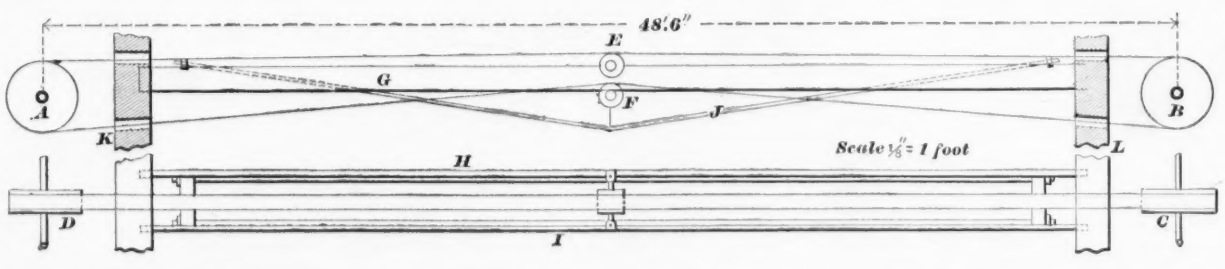
Shop Kinks.

No. 38.

BY LEWIS F. LYNE.

TRANSMISSION OF POWER BY BELTS AND WIRE ROPES.

In transmitting power from one line shaft to another in opposite buildings, I have frequently observed some of the most elaborate devices and expensive constructions. In one instance power was required to be transmitted from a main shaft to one in a shed for driving circular saws. The distance between the two shafts was about fifty feet. First, two large grooved pulleys were put up and a chain placed in the grooves. The speed of the main line was about 150 revolutions per minute, the diameter of the wheel upon it being six feet, which would cause the chain to run about 2,800 feet per minute. After the chain had been running a few hours it was demonstrated that it would not answer the purpose, because of the wear of the individual links causing such a lengthening out of the chain as to be very dangerous The chain was therefore removed and a manila rope substituted in its place. This rope was not a success by reason of its elasticity, and being affected by every change in the humidity of the atmosphere. Next in order was a hemp rope, but this too failed on account of the excessive wear. Finally, a countershaft was placed midway between the shafts, and pulleys were applied for two leather belts.



These experiments were tried by a gentleman who is a good practical man, and has a reputation for being a first-class engineer. They cost very nearly a thousand dollars, besides incurring a considerable loss of time. As a final result an expensive arrangement in the shape of a 3-inch countershaft with two 36-inch pulleys was adopted, which occupied unnecessary room. A better result might have been obtained by a single belt and two 12-inch carrier pulleys.

There is nothing new or novel in the arrangement which I propose, but it does seem that this plan has not become generally known, particularly among young mechanics and engineers who have lately made their appearance in the professional arena.

A few years ago I had occasion to erect some machinery in some buildings. A transmission of power had to be made from the main line shaft in the machine shop to drive the shaft running through the blacksmith shop and boiler shop. The distance between the two lines was 48½ feet; and the draughtsman at first made a drawing showing an underground line shaft at right angles to the other two, which required two vertical quarter-turn belts at the ends. This was a very bad arrangement, for the reason that vertical main driving belts ought to be avoided, wherever possible, particularly quarter-turn belts.

It is almost always necessary upon main belts like those described to use a tightening pulley, to prevent the belt from slipping, while the same transmission can be used with satisfactory results upon transmissions of minor importance, as upon light shafting or the countershafts of machines.

Underground shafts, as a rule, are neglected, so that the evidence was against the underground shaft and the quarter-turn belts.

I finally assumed all risks, and put up the transmission device shown in the accompanying engraving. I was not surprised to find all sorts of objections to it, especially from men who ought to have known better, and who insisted that there should have been a countershaft and two belts.

Two pulleys, *A* and *B*, 36" in diameter, were placed upon the main lines of shafting, *A* being the driver and *B* the driven pulley.

Holes were cut in the brick walls *K*, and iron boxes inserted for the belt to run through. These boxes were of ⅜" boiler plate, bent into the required shape and welded. Two timbers, *H*, *I*, each 3" × 12", of yellow pine, were placed side by side, and supported by ¾" truss rods *J*, as shown.

The timbers *H*, *I*, were composed of four pieces, the joints being made by scarfing the timber edgewise, leaving an offset so that when the joint was bolted together a key was driven into the opening, which drew the ends of the timbers together. Near each end a piece of timber was morticed into these timbers, as shown, to hold them together, also to form a support for the ends of the truss rods, which pass through these pieces. These timbers *G* had two pulleys, *E*, *F*, each 12" in diameter at the center, for supporting and steadying the belt. After the timbers *H*, *I*, were put in place, the sides and top were boarded up, so as to make a water-tight covering, while the bottom was left open for inspection, oiling, and taking up the belt. The belt was 8" wide and of double thickness.

When the engine was started and all the work put on, the speed of the shaft *C* was as uniform as that of *D*, and the jerky or unsteady motion of the belt—owing to its great length, 106 feet—predicted by a number of workmen, did not appear at all. This transmission has been working about eight years, giving entire satisfaction.

I have known similar transmissions of power to have been made where the shafts were one hundred feet and upwards apart. The belts were single, and in one instance 12" wide.

The expense of countershafts and large extra pulleys in belt transmission is often unnecessarily incurred. For transmitting power distances of seventy-five feet and upwards, I advocate the use of wire-rope. This method of transmitting power, might be more generally employed. In putting up wire-rope belts, a person having little or no experience in this line may make the pulleys too small in diameter, which will cause the rope to wear out very rapidly. Wire ropes having a hemp center wear much the best when used for belts. If the rope is subjected to short or numerous turns, it should be of much finer wire than when subjected to a straight pull.

Single wire rope transmissions may be made through distances varying from 50 feet to 250 feet with satisfactory results; single transmissions, being the use of two wheels and an endless wire rope.

For distances of 250 feet and upwards, it is better to have an intermediate countershaft and use two belts. With these wire-rope transmissions no carrier pulleys should be used, as they will chafe the wire and wear it out very quickly.

Power may be safely transmitted by wire ropes distances of 400 ft. to 450 ft. with satisfactory results. A wire rope $\frac{3}{8}''$ in diameter, running over wheels of 4 ft. in diameter, making from 85 to 145 revolutions per minute, will easily transmit from 3 to 5 H. P., while a rope $\frac{3}{4}''$ in diameter, running over wheels 12 ft. in diameter, running 140 to 145 revolutions per minute, will transmit from 162 to 175 H. P.

I have frequently known wire ropes to fail because of the careless and rough manner in which the wheels were fitted up. The grooves should be turned and made quite smooth. The filling in the bottom of the grooves should be fitted in such a way that no sharp corners can come in contact with the rope. The grooves should be made widest at the bottom, so that the filling may be securely held. This filling is made either of wood, rubber, tarred marline, and sometimes leather. Hard rubber is undoubtedly preferable to the other substances, being more readily applied, and more durable, besides being easier upon the rope. For a cheap filling the groove may be wound full of tarred marline by slowly rotating the wheel, but a cheap filling will give but little satisfaction.

When a wheel is too small the wire rope will slip, tearing out the filling and destroying the rope. Better have wheels 6″ too large than 1″ too small. It is always best to have the driver and driven pulleys as near equal diameters as possible, and make the changes of speed in transmitting to the countershafts. The shafts should be heavy, with bearings well supported upon solid foundations. The wheels should run perfectly true, otherwise the rope will be constantly shaken, producing a vibration of the rope and consequently an unsteady motion. Heavier ropes than are actually required should never be used, as they rather consume than transmit power by extra friction, and are soon destroyed.

All countershafts and wheels should be carefully aligned with each other, ever remembering that a little extra time spent in this direction will prove economical eventually.

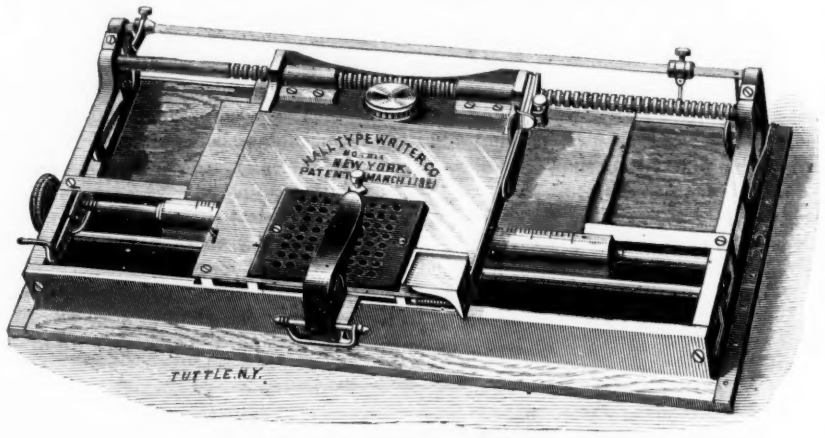
Hall's New Type Writer.

The chief object of the inventor of the type writer, represented by the accompanying engravings, has been to reduce the number of parts, and also their size and cost while retaining the necessary qualities of clean, plain and rapid printing. The case that covers this apparatus is $7\frac{1}{2}''$ wide, 15″ long and 3″ high. The mechanism, as shown in the perspective view is attached to the board that forms the bottom of the case. It consists of two skeleton frames *B* (see Fig. 1), connected together by bars and plates. Near the center of this frame is a metal roller, having a rubber face. This roller is designed to hold and move the paper to be printed upon, as shown at *a*. The paper is placed around the roll as shown, and is held in contact with the roll by the clip *b*, which has a spring attached to create a uniform pressure. This pressure may be released by lifting the screw at 9. The plate *g* has a flat surface at the top upon which the paper rests while receiving the impression. The clip is graduated the same as the gauge bar *r*, at the top of the apparatus. The rubber faced roller has a small lever at the extreme left to rotate the roll by a hitching motion. At each stroke or movement of the lever the paper is advanced one line, and after it has been printed the paper is advanced another line by again moving the lever, and so on, until the sheet of paper has been filled. The printing mechanism is attached to a carriage *A*, which moves step by step in printing from left to right, being guided by the round bar *R*. This bar is full of circular grooves, resembling the teeth in a rack upon a lathe or planer. The teeth of a small gear upon the carriage engage those upon the bar, so that a coiled spring within the gear propels the carriage toward the right, as each impression is given. When the line has been printed, the thumb latch at the right of the carriage is depressed, disengaging the spacing mechanism from the teeth in the bar, after which the carriage is moved to the left side to commence a new line. The length of a line is controlled by setting the two slides upon the gauge-bar to the required width; and when the carriage reaches the right end of the line, a small arm 12, upon the carriage raises the hammer 10, and strikes the bell *h*, which notifies the operator that a new line must be started. When a word has been completed, a space is made by depressing the spacer 20, which comes under the little finger of the right hand in printing. The width of space is regulated by turning a thumb nut at the right of carriage. The form *F* (see Fig. 2) containing the type and other characters, of which there are seventy-two in all, is made of an elastic material, especially prepared for that purpose.

This form is attached by screws to the form-plate. Each individual type and character in the form to be printed is brought under the screw *J*, and in front of a hole through the inking plate by a very ingenious piece of mechanism. The printing stud *J* is to regulate the pressure upon the type, as the printing arm *P*, Fig. 1, is depressed. The mechanism above mentioned may be understood by an inspection of Fig. 2, where 25 represents the under side of the carriage or printing frame. The form *F* is pivoted to the ends of two arms or links at *m*, *m*. These links in turn are pivoted at 17,17, to the frame *K*, having a curved slot to admit the post *J*. This frame is pivoted to one end of the links *H*, *H*, while the other ends are pivoted to the carriage at 16, 16.

From this it will be seen that a pantagraph movement is thus secured which keeps the form precisely square at all times while allowing it to move freely in all directions. Fig. 3 shows this movement more clearly, the form-plate having been removed to show the details. Again referring to Fig. 1, the reader will readily understand that when the point *i* of the printing arm *P* is moved from hole to hole in the top of the carriage, each type represented in the form *F* is brought into position under the post *J*. As the point *i* enters the hole, a gentle pressure is given, which makes an impression upon the paper.

This will be understood from Fig. 1, where *F* represents the elastic form. By pressing the arm *P*, the type to be printed is brought in contact with the paper at *g*. This pressure also brings the type into contact with the inking plate, the same being true of each impression. Two spring arms at *Q* raise the form clear of the paper and inking plate, when the pressure is released. For rapid printing, the operator can readily learn the positions of the holes, enabling him to find them without paying any attention to the letters upon the card at the bottom. The dotted lines show the position of the carriage when raised to inspect the work in progress. Elastic forms containing any desired style of letters are furnished with this type writer. The apparatus is easily and quickly operated and is without complication of parts. It is so simple that it is used by children of ten years of age and under. Instances have been brought to our notice in which children have learned the alphabet, and learned to spell words, by means of this type writer.



HALL'S NEW TYPE WRITER.

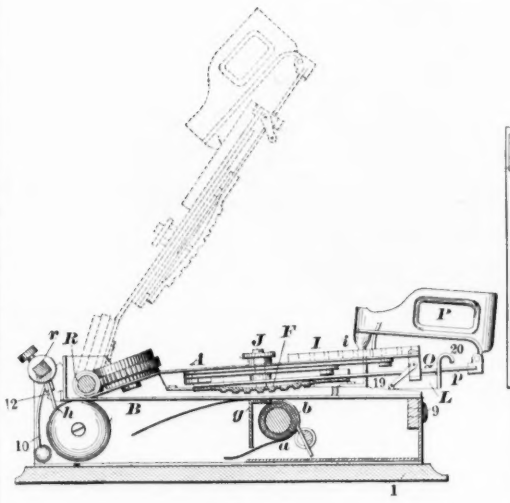


FIG. 1.

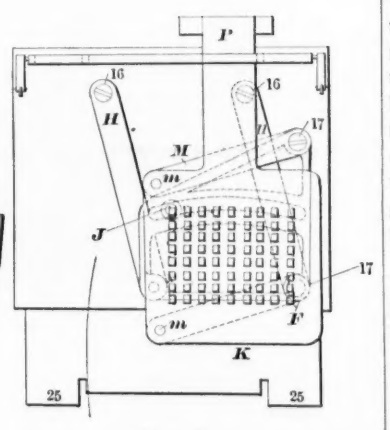


FIG. 2.

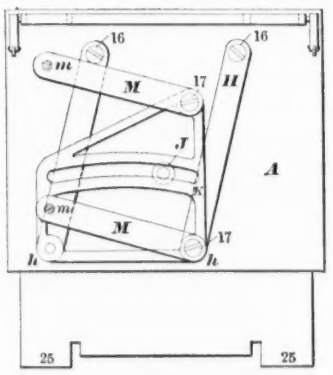


FIG. 3.

The machine is made by the Hall Type-Writer Company, 853 Broadway, New York.

The Influence of Small Manufacturing Interests.

It is difficult, except from extended observation, to form anything like a correct idea of the influence of the small isolated manufacturers upon the general and total manufacturing interests of the country. It is, perhaps, quite as difficult to understand how these manufacturers in a small way, usually unfavorably situated with reference to transportation, manage to hold their own against the competition of concentrated labor and capital in what are considered more favored localities; that is, in cities and large towns, where the full value of concentration can be realized, and where transportation and other facilities are favorable.

Only a few years ago we were treated to abundance of argument going to show that the employment of modern labor-saving machinery would result in the concentration of manufacturing to the exclusion of small manufacturers from participation. The facts, however, do not seem by any means to bear out the conclusions then reached. On the contrary, taking New England, for instance, as an example, so far from being driven out of existence, these out-of-the-way manufacturers not only continue to increase in number, but continue in some way to thrive quite in proportion to the large manufacturers; in fact, when it comes directly to a matter of close competition in prices between the large and the smaller manufacturers, the smaller is by no means always the first to yield. The advantages of transportation are sometimes, in manufacturing, more apparent than real, as, for instance, where the products are of wood, when it is generally cheaper to transport the finished product than the raw material. This difference is frequently more than enough of itself to overcome the advantages of concentration, and leaves the fixing of current prices with the small manufacturers.

But it is not alone in products from wood that the small manufacturer asserts his influence. In many instances, in the case of articles manufactured from the metals, particularly from steel, and where, in the total cost, labor is a large factor, the result is substantially the same. In these instances the small manufacturer finds his advantage in the low cost of plant and power, and in a less cost of labor. The cost of labor, and to a certain extent the cost of power, affect only the product of manufacturing, which may be more or less according to demand, but the cost of plant is a constant factor, without much reference to the quantity of the product (or the demand), and hence is felt in slack times to even a greater extent than in flush times. Cheap land and cheap buildings incidentally provide the isolated manufacturer the advantage over his crowded competitor of profitably occupying more room for his purpose—an advantage that goes some distance towards offsetting any disadvantages under which he may labor.

The lower wages paid in out-of-the-way localities does not imply that the workmen in these localities, so far as the comforts of life are concerned, are not quite as well situated as those in large towns and cities; on the contrary they are, generally speaking, better off in this respect, the owning of comfortable homes being with them the rule rather than the exception. It means simply that being surrounded by a farming population carrying on their operations like the manufacturers in a small way, and like them remote from markets, they can live better on the wages which they are willing to accept than they can live in the cities on the wages that the city manufacturer can afford to pay.

The present practice of buying and selling, by which the buyer and manufacturer do not necessarily nor generally come into contact, whatever may be said of it in other respects, directly favors the small manufacturer; also the present practice of special manufacture of parts of machines and machinery. On the whole there are many things that favor small industrial enterprises, and especially in New England, and more and more (instead of less) every year, there and in other sections, they will interpose a check—generally a wholesome one—on the demands of centralized manufacturing capital, which it has at one time and another been seriously urged would eventually become the reverse of beneficial.

According to the Boston *Commercial Bulletin*, the spinners at the ropewalk in Bath, Maine, wind huge skeins of manila or hemp around them, catch a thread or two of it upon the hook, and as the spindle whirls walk slowly backward down the length, spinning as they go, and leaving before them the long twisted strand. Every twenty minutes they disappear from sight, and are seen as far as the eye can reach coming into view down the dimly-lighted walk nearly a mile away. Thirty or more times a day make the wand, and every wand is a half mile, and every day each spinner walks fifteen miles, and spins seven miles of hempen strands.

The following extract from the Statute Laws of Iowa was recently made the basis of a decision by the State Board of Railroad Commissioners in a case of discrimination:

"No railroad corporation shall charge, demand or receive from any person, company, or corporation for the transportation, or for any other service, a greater sum than it shall at the same time charge, demand or receive from any other person, company or corporation for a like service from the same place, or upon like conditions or under similar circumstances; and all concessions of rates, drawbacks and contracts for special rates shall be open to and allowed all persons, companies and corporations alike, at the same rate per ton per mile by car-load, upon like conditions and under similar circumstances."

Grinding and Polishing Metal Surfaces by Hand.

BY THOS. F. HAGERTY, M. E.

REPRODUCED FROM THE AMERICAN MACHINIST OF DECEMBER, 1878.

There is no job the worker in metal is called on to do that requires the exercise of his brain and muscle in the proper direction more than the grinding and polishing of metal surfaces on that class of work where machinery cannot aid him. The more he exercises his brain, the more saving he will be of both his time and muscle. The practice generally employed by machinists in grinding and polishing either new or old work is to mix the polishing material with oil, usually refuse machinery oil; in most cases this is a great mistake, and has caused the loss of time, patience and money. Take, for instance, the grinding to a true bearing of a stop cock, a valve seat, or a slide valve. There are few machinists but what have had more or less of that class of work to do, particularly in jobbing shops, and we seldom find one who uses the same method of accomplishing the job that is practiced in shops where that class of work is made a specialty. In fitting and grinding the plug into the barrel of a cock, a little judgment and care will save a great deal of hard labor, and in no case should oil be mixed with any of the grinding material, for the following reasons: If fine emery, ground glass or sand are used with oil, it requires but a few turns of the plug in the barrel to break up the grains of the grinding material into very fine particles; the metal surfaces also grind off, and the fine particles of metal mixing in with the grinding material and oil, make a thick paste of the mass. At this stage it is impossible to grind or bring the metal surfaces to a bearing, as the gluey paste keeps the metal apart; if more grinding stuff is applied it will prevent the operator from seeing what part of the barrel and plug bears the hardest. Again, if the grinding material be distributed over the whole surface, the parts that do not bear will grind off as fast as the parts that touch hard, as the particles work freely between the surfaces; should the barrel and plug bear equally all over when fitted it requires more care than if it were a top or bottom bearing, as that part of the barrel and plug across the "waterway" grinds twice as fast as the other parts; therefore, it should be kept the dryest. Now this objection holds good in the grinding of valve seats or slide valves, to wit: the separation of the surfaces of the metal by a thick, pasty grinding material. In order to bring the surfaces to a perfect bearing rapidly and with little labor, the following directions will be found worth a trial:

To grind a stop cock of any kind, first see that the plug fits the barrel before it is taken from the lathe. Run a half-round smooth file up and down the barrel to break any rings that may be in it; a few rubs of a smooth file back and forth over the plug will break any rings or tool marks on it. Wipe both parts clean. Use for grinding material fine molders' sand sifted through a fine sieve. Mix with *water* in a cup, and apply a small quantity to the parts that bear the hardest. Turn rapidly, pressing gently every few turns; if the work is large and the lathe is used, run slowly; press and pull back rapidly to prevent sticking and ringing; apply grinding sand and water until a bearing shows on another part, then use no more new sand, but spread the old that has worked out over the whole surface. Turn rapidly, pressing gently while turning; withdraw the plug and wipe part of the dirt off, and rub on the place a little brown soap; moisten with water and press the surfaces together with all the force at hand, turning at the same time. Remove the plug and wipe both parts clean; next try the condition of the bearing by pressing the dry surfaces together with great force. If the parts have been kept together closely while grinding, and the plug has not rubbed against the lower part of the barrel, the surfaces will be found bright all over and a perfect bearing obtained. If an iron barrel and brass plug are used, or two kinds of brass, a hard and soft metal, soap should be used freely when finishing up, as the tendency to form rings is greater when two different metals are used.

In grinding a slide valve which has been in use until hollow places have worn in the surface, emery mixed with water, or sand and water, will be found better than oil, unless a light body oil, such as kerosene, is used. If water is used with the grinding material, soap should be rubbed on hollow places, and the grinding stuff should be applied to the high parts in small quantities, keeping the low parts clean and dry until an even surface is obtained all over; then the worn out stuff should be used for finishing up. In polishing metal, oil that will "gum up" should not be used with the polishing material unless for a dead fine polish. In polishing old brass work which has been scratched and tarnished by wear, pumice stone or bath brick should be used with soap and water for scouring off with, and rotten stone with kerosene oil for the wet finish, and dry for the final polish. The same method should be used for new brass work.

New work should require, after leaving the lathe and vise tools, but little polishing or grinding, and every good workman should try to avoid using an emery stick or emery cloth, as with proper care in the use of tools a great deal of grinding and polishing can be dispensed with.

Personal.

L. C. Jewett, formerly of Toledo, O., and, until recently, foreman of the foundry of the Hartford Engineering Company, has taken charge of Otis Brothers & Co.'s foundry at Yonkers, N. Y., with an interest in the profits of its business. In a letter received by us from Otis Brothers & Co., particular satisfaction is expressed in Mr. Jewett's management. Mr. Bartlett, from the Rhode Island Locomotive Works, has become master mechanic of the whole establishment (the Otis Elevator Works).

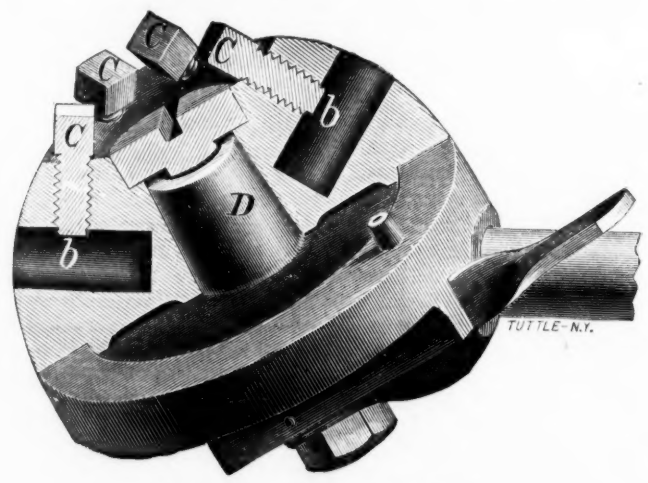
This is a good year for industrial exhibitions, both financially and mechanically. The Cincinnati and St. Louis exhibitions have closed with good margins of profit, the latter being the most successful ever held in that city. The sales of tools and machinery at the exhibitions in Boston, Cincinnati, St. Louis and Chicago have been unusually large.

Improved Turret-Head Tool.

The AMERICAN MACHINIST of November 26, 1881, contained an illustrated description of a turret-head tool, designed for use in an ordinary lathe, by T. R. Almond, of 84 Pearl street, Brooklyn, N. Y. Since that time, and while making preparation for its manufacture—which he has only recently commenced—improvements have been made in the device, which may be explained by means of the accompanying engraving.

As formerly constructed, the movable section, in which are the holes for receiving the tools, was guided in its revolution to bring the different tools in position to be used, by being interlocked near its circumference with the stationary section to which the center is attached. The trouble with this arrangement was found to be a lack of sufficient bearing surface at the point of interlocking, the result of constant use being to wear lost motion, and hence bring about an improper alignment of the cutting tool.

To remedy this, the part *D* has been added to the stationary section. This part is turned tapering, and the outer section is correspondingly bored and fitted to this part by carefully grinding. This affords a large bearing surface to maintain the relative truth of the two sections, and at the same time the interlocking surface near the circumference is preserved, thus making the surface of *D* in all respects additional bearing surface.



IMPROVED TURRET HEAD TOOL.

The part *D* is tapped for the screw, as shown in the engraving. This screw passes entirely through the stationary section, and is provided with a jam nut on the outside. This arrangement makes it entirely practicable to adjust the two sections to very accurate contact, so that the one may be moved easily upon the other, but at the same time be without any lost motion.

These improvements, as may be readily seen, add materially to the utility of the tool without in any sense impairing the simplicity of its construction.

The following useful hints for the management of steam pumps are given by the Dean Pump Works of Indianapolis:

Never use a smaller pipe on the suction than the list indicates.

Avoid right angles in the pipe, where it is possible.

Where it is practicable, make bends with a large radius.

Put a foot valve and strainer on the end of the suction pipe.

Do not place the pump more than twenty-nine feet from the water.

Where hot water is pumped, the supply must be above the pump.

Make all joints in the suction pipe tight.

A small leak in the suction is very detrimental.

Keep the stuffing-boxes nicely packed.

Oil the pump before starting it, and keep the oil wiped off where it is not needed.

Some engineers seem to think that if their boilers are supplied with water there is no need of looking after the pump, or taking any care of it. A good pump is as worthy of being taken care of as a good engine, and we would suggest to all engineers and persons using or having charge of pumps, that they spend a few moments every day in cleaning them up, removing all extra oil on them, wiping off the dust and dirt, and seeing that they are in good condition and working well.

The *Railroad Gazette* of October 13th has information of the construction of 491¾ miles of new railroad, making 8,081 miles thus far this year, against 5,340 miles reported at the corresponding time in 1881, 4,135 miles in 1880, 2,507 miles in 1879, 1,422 miles in 1878, 1,548 miles in 1877, 1,740 miles in 1876, 903 miles in 1875, 1,180 miles in 1874, 2,897 miles in 1873, and 5,147 miles in 1872.

Industrial Education.

Gen. Francis A. Walker made an address at the National Convention of Teachers, held recently at Saratoga, in which he advanced the following ideas:

The present system engenders false ideas in regard to labor. The youth of our schools and colleges are more influenced by the ideas of Plato and Aristotle than by any authors of to-day. These philosophers lived and wrote in a period of caste. They often express disgust for labor and the ordinary pursuits of life. Plato taught that geometry should not be taught for any practical purpose. These false ideas completely saturated Roman civilization. This is seen in the meagre attention given to practical studies. Education was only for the aristocracy until the time of Pestalozzi. The complaint against the present system comes from the best practical minds. They see that the educational methods are false. Few of our schools present mechanical employment as equally honorable with mercantile, literary and professional pursuits. A test made among pupils of Boston and Quincy public schools showed that out of thirty-one, one, and that a girl, expected to work for a living. One boy frankly said that he expected to be a "representator" or a President. These notions must be corrected, and the children taught the facts which they will experience in actual life. The useful arts must make up the bulk of the study of every child after the secondary grade. It will not be a difficult thing to fit the new work to the old system when the need is seen.

Drawing and the use of tools to secure perfect manufacture are as good mental discipline as anything else. All schools should give some elementary instruction looking toward this end. The public must be aroused and teachers must be qualified. Much has been done already. The Kindergartens have led the way in primary instruction. At Hampton, Va., in Prof. Adler's New York Workingman's School, at Jamestown, and at the Manual Training School at St. Louis, good work has been done, and all these schools have been well sustained. In this country these schools have been a matter of philanthropy; in Europe they are purely matters of business. Enlightened self interest has led to their establishment. There are forty-two such schools in Prussia alone. France requires all pupils in public schools to be taught the use of tools when they reach the grammer grade. These provisions have proved their utility. They are equally needed and would be equally successful here.

We recently saw in the office of the Hartford Boiler Insurance Company, Hartford, Conn., a piece of plate cut from the cylinder of a boiler which was under inspection about 7″ × 3″ and only *one sixty-fourth of an inch in thickness*. The boiler had been idle for some time and its owners sent to the company to have it inspected before starting up again. This shows the necessity of careful boiler inspection by thoroughly competent inspectors.

Blake's Automatic Rotary Cut-Off Valve and Hydraulic Regulator.

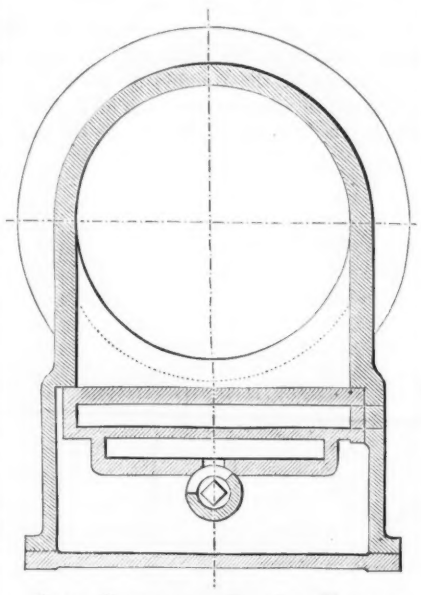
The accompanying engravings represent, in section, a steam engine cylinder fitted with a new automatic valve gear and regulating device, the invention of John H. Blake, of Batavia, N. Y.

Referring to these engravings, it will be seen that the main valve does not differ essentially from the ordinary ported box slide, except that the exhaust is carried off through the bottom edge of the valve, as shown by the dotted lines. This valve is actuated by an eccentric in the ordinary manner.

Upon the back of this valve, and traveling with it, is the cut-off valve, which is driven by gearing from the main shaft in such a way that it shall make a complete revolution in unison with the revolution of the engine.

The valve shaft, after it enters the steam chest, is of square cross section, and entering a square hole in the end of the rotary valve rotates it, and, at the same time, permits of its longitudinal movement.

The ports in the rotary valve are opposite each other, and are of sufficient width to produce a latest cut-off of three-quarters stroke, though any desired point of cut-off may be obtained. The passages from expansion valve ports to ports in face of main valve are V-shaped.

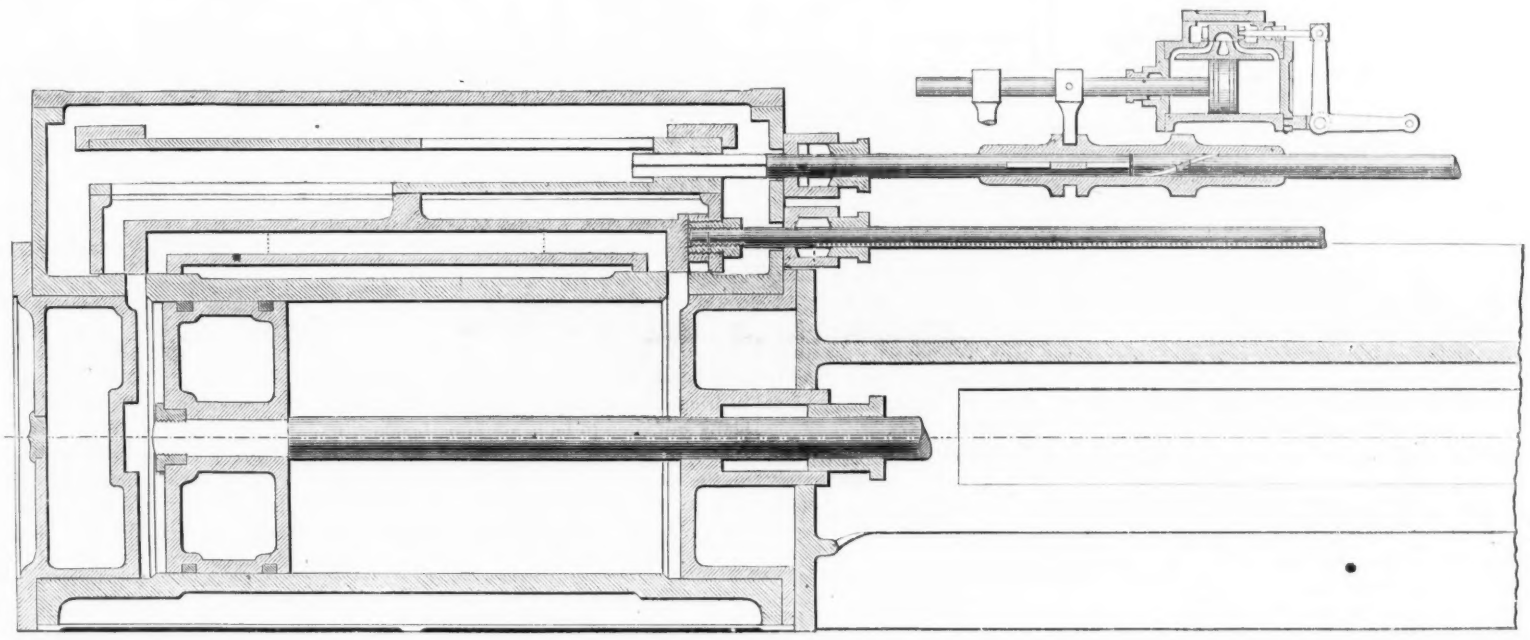


CROSS SECTION OF CUT-OFF VALVE.

If the relative position of the rotary valve to the main slide is such that the former commences admitting steam to the latter as the stroke begins, then the cut-off occurs at three-quarters stroke. Any *advance* of the relative position of the rotary valve produces an earlier cut-off, and this advance is accomplished by the following means: The rotary valve shaft is made in two sections, motion being transmitted from one section to the other by the coupling sleeve shown in drawing. One end of this sleeve has a feather projecting into a straight slot in one section, the other end having a stud projecting into a spiral slot in the other section. Hence any longitudinal movement of the sleeve produces rotation of the expansion valve, and the cut-off can be regulated as desired.

To render the cut-off automatic, it is simply necessary to connect the sleeve to the governor, as in the usual manner. But instead of this the sleeve is connected to the piston rod of a small hydraulic cylinder, the piston of which is worked by the pressure of steam in the boiler. The valve of this cylinder is connected with the governor, and is adjusted to the center of its seat when the governor balls are at a height necessary to produce the desired speed. Any variation in speed will cause the prompt extension or reduction, as the case may require, of the point of cut-off. The action of the regulating mechanism may be very powerful, and the desired degree of sensitiveness is obtained by regulating a globe valve on the exhaust from the hydraulic cylinder. The governor itself being relieved from any work, has merely to indicate the changes.

The chief feature of this system seems to be the means taken to make the point of cut-off independent of the position of the governor, instead of there being a rigid connection between the governor and valve gear, and a consequent variation of speed for the various positions of the governor. Water being practicably incompressible, when the valve of the hydraulic cylinder is in the center of its seat, the piston, and with it the cut-off valve, are firmly locked in the position they may have assumed.



LONGITUDINAL SECTION OF CUT-OFF VALVE.

Begin to lace in the center of the belt, and take care to keep the ends exactly in line, and to lace both sides with equal tightness. The lacing should not be crossed on the side of belt that runs next the pulley. Thin but strong laces only should be used.

LETTERS FROM PRACTICAL MEN.

A Boiler Explosion from the Use of Crude Oil.

Editor American Machinist:

I have noticed in several numbers of the AMERICAN MACHINIST statements in regard to the use of crude petroleum to counteract the evil effects of boiler incrustation. Having used it extensively, I can certify to its value as a *tonic*, not as a *preventative*. Five gallons of the crudest of crude oil once a month (that is, every time after we cleaned out), in a nine foot marine boiler, kept the deposit from hardening, or becoming baked into scale. In the four-inch water space around the furnace we found just as much deposit and about as thick on the plate as when we didn't use the oil, but instead of being very hard and impervious to water, it was porous and crumbled away at the touch. It was easily scraped off, or when loosened by digging in spots into the surface with scrapers, it could be washed off by a stream of water, under good pressure, by using a bent nozzle so that the stream could be directed at it at any required angle. In plates remote from the fire, such as the bottom of the shell, the deposit was in the form of a muck, resembling greasy grindstone sludge.

When not using crude oil, we would have to use chisel-pointed chipping-bars, and sometimes strike the bar with a small sledge to get under the skin.

When it could be done, I used to put a pailful of crude oil into the boiler just before blowing off, and so get it all over the inside; then, if we could let it stand for a while (the longer the better) the deposit would be much loosened and softened thereby; but when running "on time," with only eight or twelve hours from the time you start to draw fires till steam is required again, any little luxury like that is apt to be neglected, and as soon as the fire is out on the firehold floor, you open the blow-off cock and let her rip, getting the hot ashes out of ash-pit and back-head while the water is coming down.

I hear a howl of protest and indignation from the let-your-boiler-cool-before-blowing-off side of the house. Correct, but impracticable in our case, with one boiler and a kick wanted out of the engine by an anxious and profane mate, while the captain is no doubt sitting in the engine-room instructing you how to do it.

By the way, the number of shining lights in the mechanical heavens that have been eclipsed by an inexorable fate which made so many geniuses captains instead of engineers is almost incredible; and the amount of setback to general mechanical progress is incalculable, from the same point of view.

Now I didn't start out to tell you what nearly everybody knows, but as I never heard any mention made of danger in the use of crude oil, I will mention an incident which may prevent a similar catastrophe. When a quantity of crude oil cannot be put into the boiler before blowing off, it is customary with some engineers to take a pailful into the boiler with them and slash it around to try and get all parts of the deposit saturated with it. The second engineer of the steamer ——, running between Colling wood and Chicago, was thus "painting" the inside of the boiler, when the fireman handed him in a lighted lamp. A terrific explosion took place, killing the second engineer and blinding the fireman, who stood in the firehold.

The explosion was heard some distance up the dock, and it made the whole boat tremble, but did no other damage. I haven't time to advance any theory on the subject, but these are the facts of the case. There is danger in an empty boiler, sometimes, as well as in a full one.

I have collected the facts of another interesting, and perhaps instructive, boiler scrape, which I will send you as soon as "No. 1 Hard" lets up a little and gives me a chance to breathe pure air instead of wheat dust.

T. W. HUGO.

Lake Superior Elevating Company,
Duluth, Minn.

Figuring Out a Selling Price.

Editor American Machinist:

In your issue of October 21, "Chips" asks why a certain percentage on the cost of material, as well as labor, should not be added to the cost of manufacturing to compute the basis for a selling price. Although I am not the one invited to answer, perhaps my way of putting it may interest some one, if not "Chips."

Suppose I am building a machine for "Chips;" everything on it is cast-iron, except the screws, nuts, &c. The machine is finished, accepted, and paid for by "Chips," and he is perfectly satisfied with the price, but in a short time finds that the cast-iron parts do not wear as well as he expected, or that they have been eaten by acids, or, in short, that cast-iron won't do at all; so he comes to me and says, "Greaser, I want another machine exactly like the first, with the exception that all the castings must be the best of brass."

This machine is finished, and the bill sent in, but I have added the same percentage to the cost of the brass castings that I did to the iron. Does "Chips" say it is all right, and pay the bill? Oh, no! he sees the point at once. He is in business for himself, and knows a thing or two. He comes round with fire in his eye and his fists doubled up, and observes: "See here, Greaser, what do you mean by charging me $75 more for this machine than the first one, when the castings cost only $40 more and cost no more to finish? Don't you s'pose I can buy brass castings as cheap as you can?"

What could I answer? GREASER.

Compression vs. Lead.

Editor American Machinist:

I am pleased to note that many of the correspondents of the AMERICAN MACHINIST are practical men, who write to benefit others by relating facts which have become developed or substantiated in their experience. But sometimes, it seems to me, statements are made by those who (blinded by some pet theory, or who, while trying to ride some commercial hobby, perhaps,) write that which has a tendency to mislead those of the readers who are not able to judge correctly for themselves; those who are endeavoring to advance in knowledge through information derived from a journal which they believe to be of an eminently practical character. For instance, how can any engineer, of ordinary observation, undervalue the utility of compression or seek to give the impression that he doubts its necessity?

My object is to offset the misleading language referred to above, by stating some well-known facts in regard to the subject of the compression of exhaust steam, which cannot be refuted.

The joints of an engine are never sufficiently close (in practice) to obviate the necessity of the intervention of some elastic medium, to act as a cushion, to gradually retard the momentum of the piston and attached parts, and that cushion must consist of either live or exhaust steam. The former can only be obtained by giving excessive lead to the valve, which entails some serious disadvantages to most engines independent of the prime evil; that of wasting steam. The clearance spaces must be filled up, and if that is accomplished by using steam direct from the boiler, when it may be done by simply compressing the exhaust steam (which will react with a force on the return stroke equal to that required to compress it, and therefore there is no appreciable loss), the expense will be considerably greater.

Another very important item when D valves are used, is, they are partially balanced by this cushioning during that part of the stroke when they are traveling the fastest, the valve crank or eccentric being near the half stroke. Thus the friction and consequent wear are reduced, as also the power required to move them. Rankine says, in substance: "The most advantageous adjustment of the compression takes place when the quantity of steam confined or cushioned is *just sufficient to fill the clearance at the initial pressure.*"

In answer to the first part of the question of Mr. Marsh, Why any degree of compression will prevent an engine from pounding when there is lost motion in its bearings? A spring which is of proper tension, placed between the piston and cylinder head, by permitting the separated parts to come together gradually—in other words, by taking up the lost motion in the joints or bearings by degrees—will obviate any shock or pounding due to this cause, which is the principal, and, in the majority of cases, the only one.

On the other hand, what is more likely to produce a concussion than to permit the steam to enter before the advancing piston, and resist with sudden force the completion of the stroke?

EDWIN M. CORYELL.

Slotting Tool for Shapers.

Editor American Machinist:

Enclosed I send you a sketch of a convenient tool-holder for slotting purposes, on a shaper. In the sketch, Fig. 1 shows a side sectional view of an ordinary shaper head. Fig. 2 shows a front view. *A* is a tool-post or holder, put in place of the ordinary tool-post. It is bored out its entire length to a suitable size (according to size of shaper), turned off to fit the shaper head, and threaded on one end far enough to allow the holder to be fastened by a nut, *B*. On the end, the thread is cut taper, to receive a nut *C*, which is also tapered on the inside. This end is cut in three parts with a saw, to about one-half the length of the holder. This is for the purpose of clamping the tool *D* (which is turned to fit the hole) in the center of the holder, with the taper nut *C*. By this arrangement the tool is securely held, and any shaped tool can be made to fit it with very little trouble.

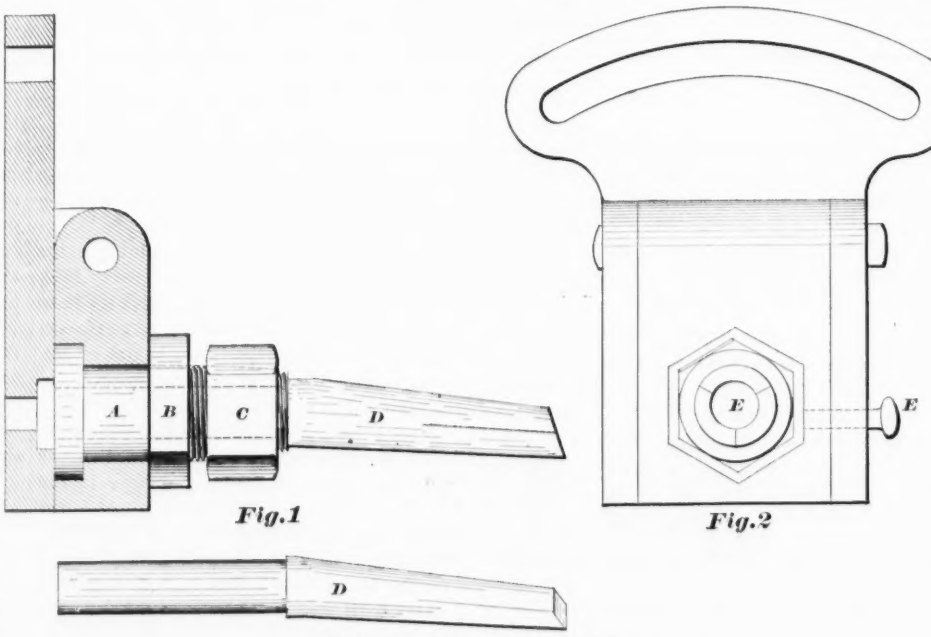


Fig. 5

The tool can also be turned in any position to suit the work. For shaping at the top of a hole, a pin *E* can be inserted in a hole on the side of the shaper head to prevent the tool from raising and catching on the backward stroke of the shaper. This device will be found very convenient for small slotting of all kinds in a shaper, and it is simple and easily made.

Waynesboro, Pa. A. B. LANDIS.

Fig. 1 *Fig. 2*

SLOTTING TOOL FOR SHAPERS.

Balancing Machinery.

Editor American Machinist:

The methods of balancing pulleys, etc., which have recently appeared in your journal, are likely to mislead those who are not well posted on this subject, as the authors have fallen into serious error, or overlooked a very important point—so important, indeed, as to make the devices presented entirely worthless as balancing machines. In view of "the greatest good to the greatest number," the writers upon the above subject will pardon me if I point out, or attempt to point out, the errors, and thus cause the subject to be studied more thoroughly.

In the AMERICAN MACHINIST, of September 16, F. F. Hemenway's article commences as follows:

"Theoretically it may be true, as is sometimes asserted, that in a revolving body absolute running balance cannot obtain, except each part of the body, considered as a unit, is counterbalanced by a similar part exactly opposite with reference to the axis, and at an equal distance from the axis."

Wherever this statement may come from, it is not true; for a body can be accurately balanced without having equal parts exactly on opposite sides of the axis and at equal distances from it, as Mr. Hemenway has rightfully concluded and explained in what follows the above statement. The conditions of a perfect balance, generally stated in the language of mechanics, are as follows:

The algebraic sum of the centrifugal forces of all the particles in the body must be zero, and the algebraic sum of all the moments of these forces must also be zero. To obtain these conditions, it is not necessary, although correct, to have equal parts diametrically opposite and at equal distances from the axis. This point has been correctly explained by Mr. Hemenway, and, I think, explicitly enough to be intelligible to most of your readers.

Passing on to Fig. 5 (which I will reproduce for convenience), we have the device, which Mr. Hemenway claims, embodies the principles of a machine with which pulleys can be correctly balanced, for running as well as for standing balance. He says: "Suppose the pulley to be in standing balance, but at the same time heavy on opposite sides and edges, as at *D* and *E* in the plan; this will be indicated by opposite movements of the weights as the pulley is revolved; in other words, each lever will indicate the balance of the side of the pulley nearest to it, and the pulley will be in balance only when it can be entirely revolved, the weights remaining stationary."

This might be true if the particles *D* and *E* could act independently of each other; but as the pulley, its mandrel and irregularities are rigidly connected, they cannot act otherwise (statically) than as a single particle at their common center of gravity. The pulley being supposed to be in standing balance, its center of gravity *F* is situated somewhere on the axis *G H*, and the relative distance of this point *F* from the levers *G* and *H* will determine the positions of the weights upon these levers. After these weights are once adjusted to balance the machine as a whole, it will remain balanced howsoever much the pulley may be revolved, and howsoever much the irregularities of the pulley may be, since the act of revolving the pulley does not change the position of its center of gravity *F*. If the pulley is "out of standing balance," then its center of gravity is situated somewhere to one side of the axis, and in that case the two weights will rise and fall as the pulley is turned to different positions. It is evident, then, that this apparatus would inform us whether the pulley is in "*standing balance*" or not, but would give us no information whatever in regard to its condition relative to a *running balance*—leaving us as much in the dark as the parallel straight edges ordinarily employed in "balancing pulleys."

In the AMERICAN MACHINIST, of October 7, page 6, "Dynamicus" passes some comments upon Mr. Hemenway's method, and then suggests an improvement (?), represented in his ("Dynamicus'") diagrams, but claims his ideas only, as yet, in a crude state, as is clearly shown by his device. He is very generous, however, and proposes to let others perfect his plans. As his plan, in point of utility, is much farther from Mr. Hemenway's method than the latter's is from the straight-edge method, I will not point out the weak points of the plan, but simply try to induce "Dynamicus" and others to study dynamics a little more. Before dropping the subject, however, I will give the following general suggestions as a key to those who may wish to give the matter some attention:

No statical test will give any indication as to the *dynamical* condition of a body, because, when the body is in motion revolving about an axis, there is acting upon the body a force which has no existence when the body is at rest.

Now, Mr. Editor, I trust this will be sufficient to set some of your inventors to work; and, if they fail to produce the desired machine, I may assist them a little some time in the future.

C. A. SMITH.

Providence, R. I.

Belts and Belt Driving.

Editor American Machinist:

In reply to exceptions in AMERICAN MACHINIST, No. 42, current volume, I would remark that the table and formula contained in the article "Belts" in No. 36, is intended for every-day use in the great majority of ordinary cases as we find them in actual practice. For belts, horizontal, or nearly so, $\frac{4}{10}$ of the circumference will be found a fair value for the arc of contact; there is margin enough allowed in the table for a somewhat less arc, and of course any excess of arc is in favor of the belt.

When a man makes up his mind as to the power he wishes to transmit, he may rely with confidence upon the result of his calculation if he conforms to the conditions of speed, &c., I have laid down; and he will not be obliged to depart from the line of good sensible practice in doing so. The only question worth considering for a moment, is whether or not these deductions call for any unnecessary outlay of money, as represented by the relation between the power driven and the size of the belt. It is to be admitted that I favor generous proportions in estimating belting, and I claim that the interest upon the difference between the cost of hard and easy worked belting, is very much less than the difference in the cost of maintenance. In further considering the exceptions taken, I will reply in detail in the order in which they are numbered.

(1.) A broad, flat-cutting tool, properly made and used, will not leave marks around the pulley-face appreciable to anything but the eye, and moreover the vibrations usually induced by the operation of turning is very liable to furnish the cross effects advocated. My remarks were applicable to the commercial pulley, which a man buys at the best figure he can in the market, rather than to an expensive article for experimental purposes.

(2.) Every-day business, where a man simply estimates the sizes of pulleys wanted under ordinary conditions, and then puts on his belts and commences to turn out work without figuring on the special conditions involved, is the ground calculated to be covered.

(3.) I attached no special importance to the arc of contact, but can refer to experiments wherein repeated trials pointed to the truth of the statements made concerning the square of the arc. A great majority of people using belts, care nothing whatever about the arc of contact; indeed it cuts no figure to speak of, for the simple reason that in estimating speeds and sizes of pulleys the arc is a matter of chance: but it happens generally in actual shop and factory experience to come not far from the value I stated, and in most cases can be managed so as to be not less than $\frac{4}{10}$.

(4.) As a matter of fact, a two-inch belt, with the factor of allowance embodied in my table, will drive as much as two one-inch belts. The *actual* tension in practice is as intangible a thing as could well be imagined. I do not advocate a direct proportion between widths and power, as will seen by inspecting the resistance column in the table.

(5.) The least diameters of pulleys in the table is merely an argument for a long-lived belt. The various widths of belts could be and are used upon much smaller pulleys than indicated, but not with the best results as to endurance. The arcs of contact and the tensions are all accounted for in the values given for resistances

(6.) It would be superfluous to inform a person credited with an extended experience, that a vertical belt must be drawn up sufficiently tight to give it the necessary grip upon the lower pulley.

(7.) The weakest point in a structure is all we may safely rely upon; and for the same reason, if our belt will drive the load upon the smallest pulley of a pair, the largest one, with equal pressure, will take care of itself.

Considering the "reasons and authorities" given in the exceptions, I would say:

(1.) I do not advocate thick belts upon small pulleys.

(2.) A gum belt is an article I purposely left out of the calculations in compiling my table.

(3, 4 and 5.) I have already expressed myself in regard to the arc of contact and tension. They are factors of very much less importance to the general operator than the resistance to slipping, although this resistance is a product of them both; but the slipping is something which makes itself felt at once, and in calculating for belting, if we can leave out the elements and handle the products, we have arrived directly at our destination. The table does this very thing for ordinary good practice, and leaves nothing to be done but to multiply the force by the motion. It would be useless to make a general rule for general cases, because satisfaction could not be reasonably expected without a knowledge of all the important conditions.

The courtesy expressed in the gentleman's regrets is fully appreciated, and with equal good feeling I would assure him that a thrust which cannot be parried shall not be dodged.

CHAS. A. HAGUE.

Chicago, Ill.

Poor Inventors.

Editor American Machinist:

If there is one class of men more deserving of public sympathy than another, it is that class known as inventors. There are a few of this class who are rightfully entitled to the name, and who have placed themselves in positions not calling for sympathy. But let a man once become thoroughly imbued with the belief that he possesses inventive genius, and with what self-sacrificing devotion he will pursue his calling, and frequently, from the lack of appreciation of his inventions, come to think all the world against him. There are thousands of men who make just as foolish experiments in any of the commercial pursuits of which they are ignorant—failure being inevitable. But did you ever obtain a patent? If not, you know nothing of the pleasure there is in it—having your name go into the Patent Office, and come out on that noble parchment, with the great red seal of the United States Government attached. It was cruel of the Commissioner to cut down the grand proportions of this document to its present diminutive size.

Then, what pleasure there is in the thought of being able to originate something! It may consist only in a mechanical movement and made applicable to a wood saw, churn or egg-beater; but the effect is all the same, and the inventor toils incessantly by day, and dreams of fame and his invention by night, with nothing to mar his peace unless it be forebodings that, for some reason, he may not be able to secure a patent.

Finally, an honest patent solicitor is hunted up, the application forwarded, and weeks of anxious solicitude pass. The lists of patents issued in the meantime are eagerly scanned, and no little concern is felt at seeing that in each list one or more inventors have been in the same line of thought, and mechanical movements have been patented very similar to his.

At last his claim is heard from, and with breathless suspense he hears the examiner's letter read. The claim will be allowed by a slight change in the combination of parts, *a'*, *b'*, *e*, etc.

In view of the number of worthless patents granted, it would seem to be the duty of the solicitor just at this point, if not sooner, to collect costs to date, and advise a discontinuance of the case. But no; this would not do. It would be a crime for which the penal code has made no provision. All the attorneys in Christendom could not prevent this man from getting a patent.

Talk about an inventor needing a flywheel! You could as easily knock a locomotive from the track with your fist as turn him from his course.

No; let him go on and invent all he can. It gives him pleasure, the United States Government a revenue, and the solicitor employment. And then when disappointment does come, he has such a happy faculty for framing devices with which to let himself down from the aerial heights to which he lifts himself.

Then when the poor man does hit on something good, some far seeing capitalist picks it up for a pittance, and the courage with which the inventor tackles some supposed untrodden field is a thing to call out at once our admiration and our sympathy.

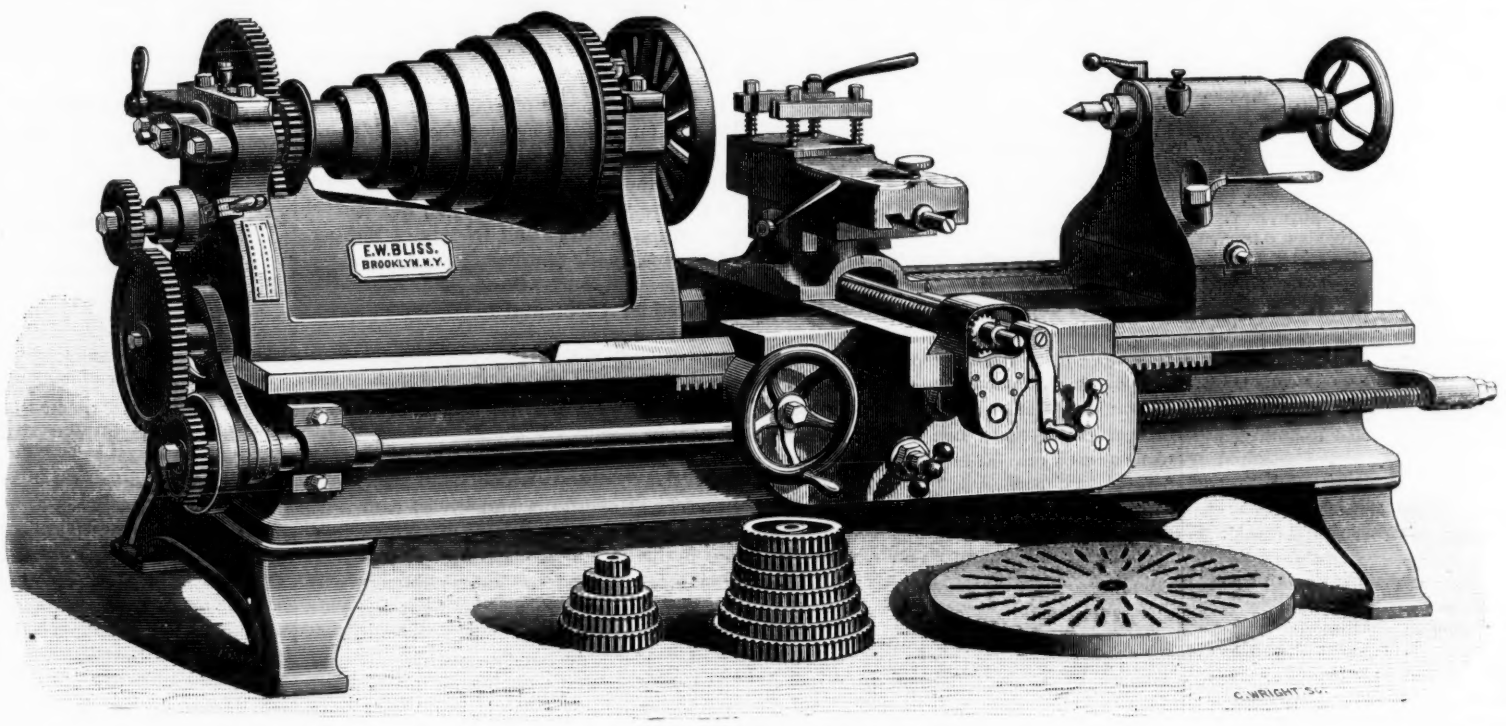
It is not *vis viva* that the inventor needs, but a brake, if one could be invented, to hold him. Air is too thin to serve for this. He only stops when by force of circumstances he becomes "dead broke," financially.

In these days of birthday associations and marriage benefit societies, it might be advisable to have an Inventor's Mutual Aid Society. Let none belong but those who have obtained patents.

A nominal membership fee, with liberal assessments from all who subsequently obtain patents, would bring into the treasury a fund from which the dependent families of deceased and crazy inventors could be liberally supported.

In conclusion, all I have to say is, never oppose an inventor or disapprove of his invention, unless you wish to incur his everlasting displeasure.

DYNAMICUS.



NEW ENGINE LATHE.

New Engine Lathe.

We present herewith an engraving of a new 32-inch engine lathe, recently brought out by E. W. Bliss, Brooklyn, N. Y. Although nominally a 32-inch lathe, it actually swings 33½ inches over the ways, and 25 inches over the carriage. As here shown, the lathe will turn 46 inches in length, the lathe from which the engraving was made being particularly designed for use on short work between the centers, and especially for face plate and chuck work. They are, however, made of any length of beddesired.

One of the noticeable features in the construction of this lathe is the great length of head stock, which is made with a 7-change cone for a 3-inch belt. This, in connection with the large steel spindle, the front bearing being 4½ inches in diameter, gives a strong support for work on the face plate and chuck, and provides for 14 changes of speed.

Another feature out of the common in lathe construction, is the manner in which the boxes are fitted to the jaws of the head stock. This is done by boring the jaws, and then after boring the boxes they are fitted to the bored jaws by turning on a mandrel. When in place they are restrained from turning by suitable dowel pins. It is claimed for this style of fitting, that it makes it practicable to renew the boxes at any time, with the certainty of the original alignment being retained, it, of course, being only necessary to bore the new boxes and turn them to fit the jaws. The nuts for the cross-feed screws are also fitted by turning, making their renewal equally easy.

The carriage slides on a heavy V at the front side, and at the back slides on a flat bearing surface. The back side is gibbed to the flat surface, and the front right-hand corner is also gibbed to prevent the possibility of its being raised by the leverage of a long over-hanging tool, as in boring.

The upper section of the compound rest has automatic feed of 11 inches at any angle with the axis of the spindle. The cross and angular feed is accomplished by means of a cross arbor carrying a miter wheel; this arbor being arranged to receive motion from the feed mechanism when desired. This miter gears into a miter on the lower end of a short vertical shaft near the center of the rest. The upper end of this shaft is provided with another miter wheel, which, in turn, gears with a miter on the nut of the screw of the compound rest. When this feed is put in use, automatically, the nut is turned on the screw, thus feeding the rest. In feeding by hand, the screw is revolved, the nut remaining stationary.

The cross feed of the lower section is also automatic. A point in these cross feeds is their arrangement for preserving the same degree, as to coarseness, on the several changes as the longitudinal feed, instead of, as is sometimes the case, being arranged for feeding much finer. The lower section of the rest is gibbed for transverse motion with a taper gib adjusted with a bolt, and the upper section with blind gibs and slotted screws.

This lathe is arranged for screw-cutting, and is fitted with the arrangement for going into gear from a single belt, described in the AMERICAN MACHINIST of Dec. 3, 1881, in connection with the illustration of the 20-inch lathe made by E. W. Bliss. The stud-gear arbor extends through the outer bearing, and to some distance inside the tail stock, where it is provided with a second bearing, by which the steadiness of this gear, especially after considerable use, is much improved. The change wheels for screw-cutting are, when the sizes will permit, plainly marked with the number of teeth, by having the numbers cast on in raised figures.

All the principal parts of the wrought work are of steel, and the bearings of copper and tin. Flat bearing surfaces are finished by scraping, and the spindle journals by lapping. The cut gives a general idea of the strength of the parts, and the length and extent of wearing surfaces.

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NEW YORK, NOV. 4, 1882.

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Visiting Shops and Learning New Wrinkles.

The worst conducted and most unprofitable machine-shops are those whose proprietors are chronically averse to adopting any ideas originated in other establishments than their own. In these days of rapid mechanical progress, it is only a question of time as to the rotting out or failure of such concerns. A knowledge of new ideas and improved methods of doing shop-work can usually be obtained, if sought for in the proper direction, but that knowledge is not likely to be pressed upon shop-owners by those originating the improvements, except when they are secured by patents or otherwise, as private property. While the most notable of these new devices and processes are set forth publicly by the technical press, there are a great many valuable ones that are for obvious reasons not fully explained (only attention called to them) in print, and that are free to be adopted by any one, without royalty or any other expense than that of putting them into use. To lay hold of these kinks and devices, it is only necessary to visit shops where they are originated or applied. The usual excuse of "no time to get away" ought not to be strong enough to prevent foremen, superintendents, and proprietors from making occasional journeys to other machine-shops, either near by or some hundreds of miles distant, observing how they do work, and comparing general methods and even smaller details.

Hardly a machine shop in the land could fail to be benefitted by the introduction of more or less of the devices brought out in other shops. The best and most successful shops are those that realize this fact and act upon it They search for new methods for facilitating good work already used elsewhere, as well as originate such methods themselves. A foreman or superintendent could profitably pack his gripsack and spend a week in visiting shops every six months, if the knowledge of improved processes brought back each time should enable him to turn out work faster and better than before.

As a rule, machine shop proprietors are ready and willing to afford visitors every opportunity to see what is going on in their establishments. It is worthy of note that those whose productions have the widest and best reputation are most courteous and obliging in their treatment of visitors, including all who come to acquire new ideas to put into practical use. True, they often furnish their competitors gratis with many useful plans and methods of manufacture, but the general good will and mechanical reputation thereby created more than repays them for the original ideas so freely imparted. In some of the most highly esteemed machinery establishments in this country, whose names are regarded as synonymous with excellence of production, especial pains are taken to escort visitors through the various rooms and departments, and to explain every machine or process of doing work with which the visitor wishes to become acquainted. The time thus taken from work and tendered free to visitors is worth, in a large shop, considerable money every year; but, valuable as it is, the proprietors find it greatly to their pecuniary interest to keep up the custom.

By so doing, a few of them have acquired not only an excellent reputation in every part of our own country, but, as well, in all enlightened countries abroad, the money value of which it would be hard to estimate.

Occasionally a machine shop has secrets to guard and will not admit visitors, but their number is few, and the secrets almost always leak out.

This is a good season to make a tour among machine shops with a note-book and pencil gathering "points" for practical application.

A Western scientific journal states that "the American Watch Tool Company, of Waltham, Mass., is building a dividing engine for ruling the glass plates which are to be used in the coming transit of Venus, in December next," etc. It is a signal proof of the superiority of this country in the mechanic arts when Venus finds herself compelled to apply to American manufacturers for the requisite appliances with which to satisfactorily effect her transit. We have always regarded Ambrose Webster, superintendent of the company above referred to, as a skillful mechanic. If the present information be correct regarding the pending negotiations with Venus, we shall begin to conclude that Mr. Webster is as gallant as he is skillful.

A press dispatch from Chicago states that recently three persons were suffered to drown in the harbor of that city, because tug owners were deterred from allowing their tugs to save them, owing to rulings of the U. S. Supervising Inspector of Steamboats, forbidding tugs to carry passengers without license under penalty of severe fine for each passenger so carried. The dispatch further states that in all, six lives have been sacrificed in that harbor as the result of this ruling.

As the object of Government supervision of steam vessels is to save human life by making travel safe, it is a curious commentary on the local administration of the law in Chicago, if tug owners really feel that they stand in any danger of being punished for such a heinous offense as pulling three drowning individuals out of the water and carrying them to the shore. Should such an action be seriously or persistently construed by any Government official as an infraction of the law regulating steamboat traffic, his case would seem to justify, if anything would do so, either a commitment in lunacy proceedings, or a resort to mob law on the part of surviving relatives and friends of the persons thus legally murdered.

Troubles Incidental to Water Power.

A paper manufacturing company was recently on trial in Massachusetts for maintaining a nuisance in the form of a dam across the Housatonic River. It seems that the dam set back the water over an expanse of low flat country, which land the water alternately overflows and leaves bare with the exception of stagnant water which gathers in pools. For the last three or four years the neighborhood has been afflicted with fever and ague, which it is alleged has been caused by the smells which arise from these pools. It was declared on opening the trial, that previous to the raising of the dam and the overflowing of the land, the oldest inhabitant had never heard of malaria in that neighborhood. This is but one of the troubles incidental to the employment of water power where streams must be dammed. Drouths, freshets and malaria are causing water powers to be looked upon with suspicion, while a steam engine is free from these ills.

We have had frequent calls for copies of the AMERICAN MACHINIST of December, 1878, from parties who desired the article by Thos. F. Hagerty, on Grinding and Polishing Metal Surfaces by Hand. That issue being out of print, and no copies obtainable, we have reproduced the article on page 4 this week. It was widely copied by the technical press just after its first publication by us, and the practical information it presents is just as applicable now as it was four years ago.

An International Exhibition will be held in Amsterdam, Holland, extending from May 1 to October 31, 1883.

Elevator Inspection and Insurance.

In our issue of June 24, 1882, after alluding to the far greater number of lives lost by elevator accidents than by boiler explosions, in proportion to the number of each in use, we called attention to the crying need of some adequate system of inspection, as a means of preventing accidents and consequent loss of life. The natural remedy suggested by such a condition of things would seem to be Government inspection under a stringent law. But as the U. S. Government could probably not interfere until empowered by Constitutional amendment, such a system of inspection would have to be applied by the various State Governments. The simple statement of the loss of life which is occurring from this cause, should present sufficient inducement to legislators.

Pending such legislation, however, or concurrent with it, it might be well to inquire whether private enterprise could not in a great degree supply this want, through a system of elevator inspection and insurance. To say that the owner of a building containing an elevator would be less willing to pay for inspection and insurance than the owner of a steam boiler, only follows from a knowledge of the fact, that the property damage from an elevator disaster is usually much less than that arising from a boiler explosion. That office buildings, however, would gain tenants more freely, if conspicuous notice were posted that the elevator was regularly inspected by a substantial company, and vouched for as being in good condition, is at least as certain as that tenants in such a building would find customers thereby made more willing to come to them. Doubtless the annual fee would have to be small, but the expense of maintaining the needed facilities for inspection would not be great. Plate glass windows, requiring no inspection, are kept regularly insured by very many owners of buildings; why not elevators?

Literary Notes.

The *Sanitary Engineer* of New York has for years been standard authority on matters pertaining to its specialty. It contains twenty-four pages weekly and is about to be still further enlarged for a very good purpose. Some time ago the *Bulletin* of the National Board of Health was discontinued because Congress failed to make any appropriation for its publication. The proprietor of the *Sanitary Engineer* proposed to the National Board of Health that he would give space to print the most important information heretofore published in the *Bulletin*, if the Board would place at his disposal such data as were needed to make the necessary compilations. The offer has been accepted, and at least one page of every issue will be devoted to continuing as far as practicable the work hitherto performed by the *Bulletin*. The public is to be congratulated upon this change and will doubtless profit by the continued neglect of Congress to provide for publishing a "Government Health Bulletin." A large number of people will now be privileged to read the records of the "Health Board" in the *Sanitary Engineer*, instead of hunting for them at the waste paper dealers.

Robert Clark & Co., booksellers, 61 to 65 West Fourth street, Cincinnati, Ohio, and 7 Stationers' Hall Court, London, England, have issued their October pamphlet catalogue of American and foreign books relating to the various departments of applied science, as follows: Part I. embraces Engineering, Surveying, Machinery, Mechanics, the Steam Engine, Locomotives, Railroads, Boilers, Bridges, etc. Part II. embraces Hydraulics, Hydrostatics, Water Works, Water Wheels, Drainage, Sewerage, Irrigation, etc. Part III. embraces Shipbuilding, Naval Architecture, Navigation, Seamanship, Nautical Astronomy and Surveying, Anchors, Cables, Rigging, the Compass, etc. A number of the catalogues of machinery establishments which are not circulated free, are also found in this list. So far as possible, an index referring to the various subjects treated, is also included. The pamphlet also includes a list of technical periodicals and magazines for subscription purposes, together with a price-list of stationery and drawing materials for engineers, architects, surveyors, and others. A feature of the book list is mention of the year in which the latest edition of each work appeared. The catalogue will be sent by the publishers to any address on receipt of a three-cent postage stamp. It contains about 40 pages.

QUESTIONS & ANSWERS.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly, and according to common sense methods.

(374) J. F. R., Huntington, W.Va., asks: Should the top or bottom of a throttle valve bear the hardest? *A.*—We suppose you refer to the seat of the valve. It is best to have the seat bear about evenly, but to be sure that the bottom of the seat bears quite as hard as any part of it.

(375) H. M., Brooklyn, N.Y., asks: Will you tell me the best course for a boy of means, 16 years old, to pursue to become a mechanical engineer? *A.*—Under the circumstances we should advise that you spend some years in a machine shop, and also the necessary time to graduate from some technical school. We also advise that you suit your own inclination whether the shop course or the school course shall come first.

(376) W. R., St. Louis, Missouri, asks: When lap is added to an ordinary slide valve, is it necessary to change the eccentric to give the valve more travel, and if so, why? *A.*—The addition of lap will generally prevent the valve from opening sufficiently for the proper admission of steam; hence it is usually necessary to increase the travel when the lap is increased in order to provide the proper port opening. An increased travel of valve also opens the port more rapidly, which is an important consideration.

(377) I. G. B., Fremont, Ohio, asks: In the plan for nickel plating published in your issue of Oct. 9, will the nickel deposit on iron that has been covered with copper, and when deposited on copper and brass will it wear well? *A.*—We have no personal knowledge of the process, but should assume that the nickel would deposit on iron that had been covered with copper if the surface was clean, and also that it would wear as well as any light nickel plate. 2. Which is the better way to set a cross-cut saw; with a hammer set or with a lever set? *A.*—We think it easier to get a uniform set by means of the lever set.

(378) M. A. L., Dorchester, Mass., asks: 1. What is the power of my engine? The cylinder is 2½″x4¾″. *A.*—You have not furnished sufficient data from which to calculate the power. To do this it is necessary to know the steam pressure, and the speed at which you run your engine. As such engines are ordinarily run we should presume it to be about 1-horse power. 2. The steam pipe is ¼″ and the exhaust pipe ½″. Are these sizes right? *A.*—No. The steam pipe should not be less than ½″ and the exhaust pipe should be ¾″. 3. What size boiler should I get to run it? *A.*—Get a boiler with 25 feet of heating surface.

(379) R. B. W., Glascow, Ky., asks: 1. How shall I make a wiped joint, such as is sometimes made on lead pipe? *A.*—Melt the solder in a ladle and pour it on the joint quite plentifully so as to heat it. As the solder accumulates wipe it into shape with a piece of cloth—bed-ticking is good for the purpose—folded several times and greased with tallow. The cloth is also used to hold the solder as it is poured on the pipe. 2. What kind of solder is used? *A.*—Plumbers' solder, usually made of two parts lead and one of tin. 3. I have charge of a steam pump 5′x10″. The tank into which I pump is 104 feet above the pump. Would it not be better to have a check valve in the discharge pipe? *A.*—It would be better to have a check in the discharge pipe, say some 4 feet from the pump, and a pet cock in the same pipe quite close to the pump.

(380) W. D., Perth, Ontario, writes, that in one book he finds the statement that water flows through the suction pipe of a pump at the rate of 500 feet per minute, while another writer states that water flows into a condenser at a speed of 40 feet per second. He asks if there is a difference in opinion of the two authors? *A.*—The velocity with which water would flow through the suction pipe of a pump would depend entirely upon the diameter of the pipe, the size of the pump and the speed at which it was run. The velocity with which water will flow into the condenser is in proportion to the vacuum in the condenser. The two statements referred to do not show any difference in opinion between the two authors, since they are not treating the same subject.

(381) R. I., New York, asks: 1. Can engineering be learned from books? *A.*—No. 2. Why will a locomotive go forward when the link is down and backward when it is raised? *A.*—Because the go-ahead eccentric is connected with the top of the link, and the backing eccentric with the bottom. 3. What is the drum of an engine? *A.*—There is no part of an ordinary steam engine that is called a drum. 4. What is the diameter of the largest driving wheels on an American locomotive? *A.*—The driving wheels of American locomotives are seldom more than 6 feet in diameter, and are usually less. There have been locomotives made in this country with driving wheels considerably larger than this—we think in one instance as large as 9 feet, but such sizes are exceptional. 5. Which country has the best locomotives for swiftness and strength? *A.*—There is probably not much difference between American and the best European locomotives, when the different circumstances under which they are operated are taken into consideration.

(382) S. R., Oneonta, N.Y., writes: We are using a condensing overhead vertical engine 42″x42″, and with a vacuum of 26″, it requires 45 pounds steam pressure, cutting off at ¼ stroke to do the work, making 58 revolutions per minute. The air pump is 21¾ inches in diameter, with a stroke of 18″. The condenser is 42″x21″x27″, out of which must be taken 570 cubic inches for injection pipe. The exhaust pipe is 11½ inches in diameter. The injection pipe is 4″, but the valve casting contracts it to 3¾ inches, out of which must come the valve stem 1 3-16 inches diameter. From the top of the injection nozzle to the level of the water is from 9 to 11 feet, and there are several elbows in the injection pipe. The injection water is dirty, with chaff floating on it which sinks and sometimes clogs the pipe that supplies the well. There is trouble with the condenser getting hot when the engine is working hard. I want to ask: 1. Is the condenser large enough? *A.*—The condenser is large enough to give good results, but the air pump is too small. The exhaust pipe is also too small. The injection pipe should have a clear opening at its smallest section of not less than 4″ diameter, and if as you say there are several elbows in it, it would be better if the pipe was 5″. You should use a strainer to keep the dirt out of the water. 2. By tapping a 2″ pipe into the exhaust pipe some 16 feet up and letting a 2″ stream of water into the pipe, will it help the vacuum? *A.*—We do not think it will help the vacuum in the cylinder. The exhaust pipe is already too small. 3. To what height will water be raised by a vacuum of 26″? *A.*—Not far from 29 feet. It would not, however, rise to that height and flow into the exhaust pipe under the circumstances named. 4. The crank pin gives trouble from heating; it is 6½ inches in diameter and 8 inches in length. Do you think it large enough? *A.*—No. It is but little more than one-half as large as it should be. 5. What do you think of phosphor bronze for crank-pin boxes, and would it be an improvement to use such boxes on this pin? *A.*—Generally speaking, where the bearing surface is ample, we do not think phosphor bronze possesses any very special advantages, but in the case of a journal too small for the work, as in this instance, it would, perhaps, be advisable to try it. 6. Why does the hand of a vacuum gauge fluctuate instead of remaining stationary? A.—The fluctuation of the hand may be due to unsteady working of the air pump, or to any cause whereby the vacuum is not steady, as it should be. It may also be caused by the pipe by which it is connected being in a situation where the exhaust steam passes by the end of it.

BUSINESS SPECIALS.

Transient Advertisements, 50 cts. a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Thursday morning for the ensuing week's issue.

"Cures Bad Draft," Parson's Blower on trial.

F. Samuelson, Pattern Maker, 38 Gold St., N. Y.

James W. See, Consulting Engineer, Hamilton, O.

Steel Name Stamps, &c. J. B. Roney, Lynn, Mass.

Portable Forges, $10. Holt M'f'g Co., Cleveland, O.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N.J.

Pat's mf'd on royalty. A. B. McCool, Pottsville, Pa.

"Makes More Steam or No Pay." Parson's Blower, 95 Liberty St., N. Y.

J. M. Badger, Expert and Commission Dealer in Machinery, 5 Dey Street, New York.

Hoerle Bros., Naugatuck, Conn. Small Dies and Special Tools to order.

J. C. Hoadley, Engineer and Expert, 29 High St., cor. Federal, Boston, Mass.

Wood Engraving done in best manner. Designs furnished. Edward Sears, 48 Beekman St. New York.

Howard S. Abbot, Solicitor of Patents, 617 7th St., opposite the Patent Office, Washington, D.C.

R. Dudgeon, 24 Columbia st., New York, Improved Hydraulic Jacks and Roller Tube Expanders.

Latest and best books on Steam Engineering. Send stamp for Catalogue. F. Keppy, Bridgeport, Ct.

Foot Power Machinery, for workshop use, sent on trial if desired. W. F. & John Barnes, Rockford, Ill.

Pattern and Brand Letters. Vanderburgh, Wells & Co., corner Fulton and Dutch streets, New York.

Pattern Maker's Assistant. By Joshua Rose. 324 pages, $2.50 by mail, postpaid. Address orders, P. O. box 3,306, New York City.

A lot of 25″ lathes designed to equal the best Philadelphia tools, will soon be ready for delivery. Ohl & Co., E. Newark, N. J

Engine Lathes, Speed Lathes, Foot Lathes, Upright Drills, Light Drilling Machines and other fine tools, Frasse & Co., 62 Chatham St., N. Y.

Wanted—To sell a Richards' Indicator in good condition. Address, F. G., Box 1, AMERICAN MACHINIST.

For Sale.—Steam Engine, extra heavy, in good order, upright, two cylinders, each 12″x20″, heavy fly wheel 7′x2′, Judson governor, bed stone, &c David W. Pond, Worcester, Mass.

The American Standard of Bolt and Nuts. Adopted by all the leading machine shops in the United States. Price $1.00. E. Lyman, C. E., New Haven, Ct.

Jas. F. Hotchkiss, 84 John St., N. Y.: Send me your *free* book entitled "How to Keep Boilers Clean," containing useful information for steam users and engineers. [Mention this paper.]

We will pay 25 cents each for copies of the AMERICAN MACHINIST for January 1, 1881, which are clean and in condition for binding. American Machinist Publishing Co., 96 Fulton street, New York.

Wanted to arrange with the right parties for the manufacture on royalty or otherwise, of a first-class automatic cut-off engine. Address, Box 10, care AMERICAN MACHINIST, 96 Fulton street, New York.

L. V. Conover, Iron Founder, 336 to 340 East 29th Street, New York. Heavy and Fine Castings of Iron, Brass, Composition and Copper made to order at shortest notice.

Russell & Struthers, Wax Process for making outline engravings. Specimens each week in the AMERICAN MACHINIST. We also do Map Engraving with best facilities. Russell & Struthers, 59 Park Place, New York.

"Extracts from Chordal's Letters," the most interesting mechanical book published. A great variety of mechanical and business topics treated in a wise and witty way that will be instructive to old and young mechanics, and interesting to everybody. As many as 150 copies have been sold in a single shop. Over 40 humorous illustrations; 320 pages, 12mo. Price, $1.50 per copy, by mail, to any address. AMERICAN MACHINIST PUBLISHING CO., 96 Fulton St., New York.

Bound Volumes and Patent Binders. We can furnish Volume 3 of the AMERICAN MACHINIST, containing the full 52 issues of 1880, or Volume 4, containing the 53 issues of 1881, neatly bound in cloth, ready to ship by express, for four dollars. Either volume unbound, three dollars. "Patent Binder" for the AMERICAN MACHINIST holds 53 weekly issues in good shape. Sent to any address by mail for one dollar. AMERICAN MACHINIST PUBLISHING CO., 96 Fulton Street, New York.

Rocks, Minerals and Stocks; by Frederick H. Smith, Consulting Engineer and Geologist. Contents: Part I. World Building, Prime Minerals and Rocks, the Formation; Part II. Gold and Silver, Industrial Metals, Coal and Oil, Industrial Minerals, Precious Stones; Part III. Stock Companies, Stock Dealing, Stock Tricks. *A vade mecum* for the use of everyone interested in these important topics. Scientifically accurate, witty, fascinating. *Sui generis* among technical books. Handsomely bound in cloth, $1.50, in paper, 75 cents. Order through your bookseller, or address The Railway Review, 182-184 Dearborn St., Chicago, Ill.

MANUFACTURES.

Clark, Raffen & Co. are building a four story machine shop on Ohio, near Kingsbury street, Chicago.

The Youngstown (Ohio) Steel Co. expect to be ready to turn out steel castings about the end of this month.

The Presumpscott Pulp Ware Co., Portland, Me., have recently ordered several Curtis steam traps of different sizes.

The Franklin Paper Company of Holyoke, Mass., is about to put in a new 100-horse power steam-engine to increase its facilities.

Kearney & Foot, Paterson, N. J., file manufacturers have just put in a new 75-horse power engine their business having increased beyond the capacity of their 40-horse power engine.

The Riverside (R. I.) Machine Company has bought out G. W. Brown of Providence, manufacturer of foot power lathes and saws. The capacity of the works is to be largely increased.

H. S. Russell, of Pitsfield, Mass., recently furnished Plunkett & Sons., Adams, Mass., a 60″ diameter steel boiler. Mahoney's Universal Patent Furnace, for burning all kinds of waste fuel will be used in the setting.

The Cartaret Chemical Co., of Newark, N.J., have ordered Mahoney's corrugated grate-bars and his Universal Patent Furnace, for their two new steel boilers, each six feet diameter. They will burn screening mixture and waste fuel.

There was never such a time for building grain elevators. At almost every railroad station in the West new elevators are being built, or old ones enlarged. The bounteous harvest will give the elevator men a "boom."—*U. S. Miller.*

The old coffin works at Rochester, Pa., which orignally cost about $25,000, were sold for $12,000 to Col. D. R. Davidson, of that place, and Mr. Early and others of Pittsburgh, who will remodel the concern for a foundry and machine shop.

The Whitney & Barnes Manufacturing Company, Akron, O., manufacturers of mowing machine knives, have filed a certificate at Columbus for the increase of capital stock from $800,000 to $1,500,000, with a view to the extensive increase of capacity.

The Korting Condenser has lately been supplied to Geo. West, Ballston Spa, N. Y., also to Waterbury (Conn.) Manufacturing Company. In both cases the result is reported as very satisfactory. Several other large Korting Condensers have been ordered.

The Detroit, Lansing & Northern Railroad Co. have contracted for the construction of extensive shops at Ionia, Mich. The buildings are to be of brick, except the wood-working shop. The contract was awarded to Detroit parties for $111,459.

The Sessions Foundry Company of Bristol, Ct., is building large additions to its works, including a new packing and shipping building, with office, 100x40 feet, two stories. A new engine will be put in. The moulding room will cover 350x40 feet. The company intends to produce malleable as well as gray iron castings. All the improvements will be pushed rapidly to completion.

Among boilers just set with the Jarvis furnace are the following: Hartford Carpet Co. one (third order); New Bedford Manufacturing Co. two; Belknap County Farm, Laconia, N. H., one; Newmarket (N. H.) Manufacturing Co., ten in all; Peacedale Manufacturing Co., two; Durham Hosiery Co., one; Granite Hosiery Co., one; P. and F. Corbin, two (the third order).

An additional story is to be built on the machine shop of the Androscoggin Mills at Lewiston, Me.

The American Lubricator Co. are informed by their representatives at Auckland, New Zealand, that they received the silver medal (being the highest award allowed) from the New Zealand International Exhibition, which was held at Christchurch this year, for their lubricators. They had to compete against a good many other lubricators both English, local and of other countries, none of which scored an award.

A. M. White & Son, Waterbury, Conn., have for the past year been working into quite a successful business in the manufacture of special machinery. They have recently completed a machine for cutting match sticks which, occupying a space of but 26″×30″, two feet high, is capable of cutting 960,000 matches a day. They also manufacture foot and power presses and upright drills, also furnish drawings and patterns on application.

Frank Grant & Co., manufacturers of emery and corundum wheels at Chester, Mass., have sold an interest in their business to Springfield parties, and the company is to be reorganized and incorporated with a capital stock of $50,000. A new two-story mill, 100x40 feet, will be built at once on the Hampden Emery Company's lot opposite its mill, near the tracks of the Boston & Albany Railroad, and it will be run by steam.—*Manufacturers' Gazette.*

The Frost Paper Mills put in one of the Hawkins patent boilers for burning cheap fuel, some eighteen months ago. Four months since they made a comparative test with this boiler and two tubulars, that were running beside it, of ordinary construction and set in the usual manner. So favorable was the comparison that the company has just placed an order with G. C. Hawkins of Boston for a duplicate of the original boiler.

The Hendey Machine Co., Torrington, Conn., write us: "Business is good. We are getting out a new shaping machine having 30″ stroke and cross feed of 5 feet, weighing about 5 tons. It will have vertical horizontal and angular feed (automatic) and will be a tool suitable for railroad shops and general heavy work. We are also getting out a 12 foot×30″ planer. We have a fine exhibit both at Boston and Cincinnati."

The Atlas Engine Works, Indianapolis, Ind., write us: "We are running full handed, and have orders amounting to about twenty-five carloads, which will be shipped within the next ten days. Among some of the outfits might be mentioned—75 H. P. engine for St. Louis; 100 H. P. engine for New York City; 100 H.P. engine with boilers complete for Cumberland, Md.; 125 H. P. Atlas Corliss engine with boilers complete for Creston, Ohio; 150 H. P. Atlas Corliss engine complete with boilers for Memphis, Tenn., and 4 90-H.P. boiler for Council Bluffs, Iowa. Among some of the shipments recently made were, 150 H. P. engine for the Hanauer Oil Co. of Memphis, Tenn.; 200 H. P. engine for Cuba, and 250 H. P. engine for the Sandwich Islands.

The Pittsburgh *Chronicle* of Oct 6 says: "A company has been formed under the firm name of Anderson, DuPuy & Co. for the purpose of manufacturing all varieties of steel under the Siemens process. Mr. Robert J. Anderson is one of the partners, and Mr. DuPuy, a son-in-law of Dr. Hostetter, another. It is understood that the Doctor will give financial solidity to the new enterprise. Mr. Daniel Shaw, late manager of the Siemens-Anderson Works, is interested in the new company, and will probably be Superintendent. The company has secured property on the line of the Pittsburgh and Lake Erie Railroad at the mouth of Chartiers Creek, and operations will be commenced at once. Within sixty days it is expected to have the works in running order. The capacity of the new concern will be 10,000 tons of finished steel annually. It will be built after the most approved style, and will contain the latest and most improved of Dr. Siemen's furnaces."

The Niles Tools Works, Hamilton, O., and salesrooms 22 South 6th street, Philadelphia, having received numerous inquiries whether they would exhibit their tools at any of the fall exhibitions, have issued a circular to inform their friends and patrons that they will not do so. It says: "We are exceedingly busy, running our works night and day (as we have been doing for the past two years) to fill our orders. Our exhibiting is, therefore, entirely out of the question. During the past year we have greatly enlarged our facilities, having made additions to our machine shop, foundry, blacksmith shop and pattern shop. We have built a new erecting shop 40 feet wide and 150 feet long, designed mainly for setting up boring and turning mills. This is fitted up to afford the greatest convenience for handling heavy work, having powerful over-head traveling cranes. We have put in a large amount of new machinery and made other provisions for facilitating work. During the year we have added to the list of tools manufactured by us the following: slotting machines, 9 inch, 13 inch and 19 inch stroke; horizontal boring and drilling machines; arch bar drilling machines; cylinder boring machines and wheel quartering machines. We have also made valuable improvements in our standard machines, and have gotten out entirely new patterns for the following: 30-inch engine lathe; 30-inch planer; 30-inch upright drill; 60-inch planer; 7-foot boring and turning mill; 66-inch double wheel lathe; 14-foot boring and turning mill and power bending rolls, for bending ⅝ inch and ¾ inch steel boiler plate. In these improvements our aim has been to keep pace with the demands of the times for increased weight, power and convenience."

Machinists' and Engineers' Supplies.

NEW YORK, Oct. 19, 1882.

Orders for all kinds of supplies continue to be of small dimensions calculated only to supply temporary wants. The fact is that prices in general are low at present. Pipe fittings were never sold as low as at the present time, while wrought iron pipe is weakening and prices will probably drop within another week. Bolts and nuts are low, so low in fact, that some of the manufacturers are indifferent as to whether they keep their works running or not. Prices in these goods will probably advance somewhat within the next two weeks. Deliveries of large machinists' tools, such as lathes and planers, continue slow, but other tools are coming along freely.

Schaffer & Budenberg, 40 John street, New York, have just got out a new circular and price-list of their High Pressure Exhaust Steam Injectors. A full line of these injectors, together with the low pressure injectors, has been received so that all sizes for all duties, are available, and can be supplied at short notice.

Iron and Metal Review.

The demand continues fair at prices which we quote as follows: Foundry, No. 1, $26 to $27. Foundry, No. 2, X, $24 to $25, Grey Forge, $20.50 to $21.50. The market for Foreign Iron continues quiet and the supply light. Prices are firm at the following quotations: Coltness, $27.50 to $28; Glengarnock, $25.50 to $26; Gartsherrie, $26.25 to $26.50; Summerlee, $26.50; Carnbroe, $24.50; Eglinton, $23.50 to $24; Langloan, $26 to $26.50. Wrought Iron Scrap in moderate demand at prices quoted last week. Steel and Iron Rails unchanged. Old Rails firm at $27 for Tees, and $30 to $30 50 for Double Heads. Merchant Bar continues slow at 2¼c. to 2.6c. with consumers waiting for a drop in price.

Banca Tin 28c.; Straits and Malacca 23¾c. to 24¼c.; Billiton 25⅛c.; Australian 23¾c. to 24c.; English Lamb and Flag 24¼c.; Spelter Common Domestic 5.45c. to 5.55c.; Refined 8c. to 8¾c.; Silesian 5.40c. to 5.55c.; Lead 5.10c. to 5.15c.; Refined 5.15c; Antimony, Hallet's 10⅞c.; Cooksons' 12⅜c.; Nevada 12⅛c.

WANTED

"Situation and Help" Advertisements, 30 cents for each seven words (one line) each insertion. Copy should be sent to reach us not later than Thursday morning for the ensuing week's issue

Wanted situation as draughtsman in machine shop on working drawings. Address, K., this office.

Experienced mechanical draughtsman is open to engagement anywhere Best references. Address, D., BOX 4, AMERICAN MACHINIST.

Wanted—Three first-class machinists and one good planer hand, who have worked on machine tools. Must be sober and steady men. None others need apply. Address, Jos. B. Reed, Cairo, Ill.

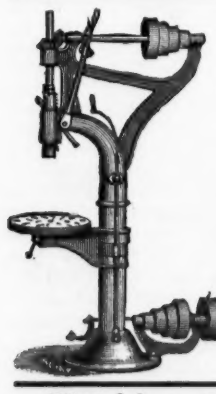
Wanted—500 feet of 42-inch diameter old boiler shells. Address, P. O. Box 1208, New Haven.

We Will Manufacture and Sell Small Patent Article that Works and Pays. Address, Company, MACHINIST Office.

Wanted.—New Compound Duplex Steam Pump. Inventor desires to arrange for manufacture. Address, Duplex Pump, BOX 8, AMERICAN MACHINIST.

Wanted—A horizontal steam boiler, 60 to 80 horse power. Second-hand or new. Address, giving fullest particulars, T. D P., AMERICAN MACHINIST, 96 Fulton street, New York City.

For Sale.—Machine shop and foundry with tools and patterns, having large run of custom work, as well as permanent contract work in foundry, in a town of 10,000 inhabitants in Central Ohio. Nearest shop 20 miles distant. Address, C. C. R., 134 W. 2d St., Cincinnati, O.



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IS NOW OPEN IN BOSTON.
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DON'T FAIL TO VISIT THE EXHIBITION FAIR.

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For Machinists, Railways, Mills, Mines, &c.
Please send for circular and state that you saw the advertisement in this paper.

ARMSTRONG'S IMPROVED ADJUSTABLE STOCK AND DIES FOR PIPE AND BOLTS.

Tapped to the U. S. and Whitworth Standard Gauges. *Adjustable* to all variations in the size of fittings. Can be *resharpened without drawing the temper* by simply grinding them. Possessing practical advantages appreciated by all mechanics. Circulars sent free on application.
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PORTABLE and STATIONARY ENGINES And BOILERS,

5 to 25 H. P. Parts duplicate and interchangeable, specially adapted to run Electric Light Machinery. Send for Circular.
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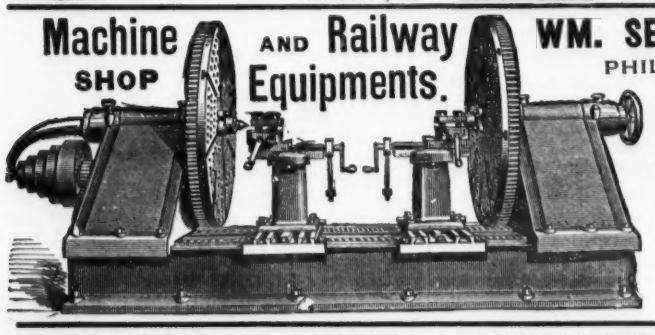
Machine SHOP AND Railway Equipments.

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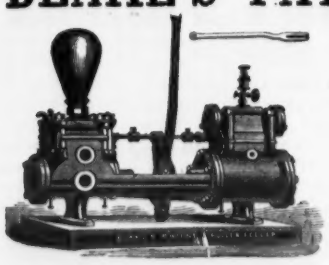
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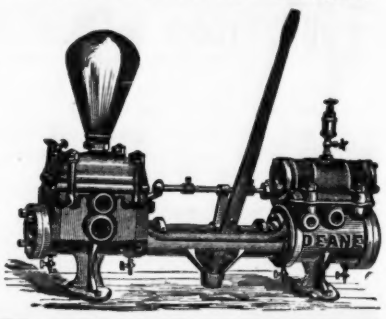

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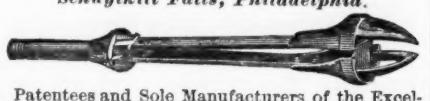
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Manufactured by CRITCHLEY & WHALLEY,
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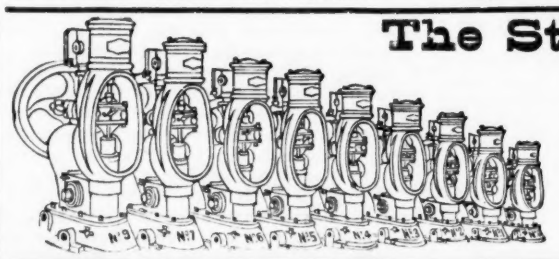
The Steam Pumps

Made by VALLEY MACHINE CO., Easthampton, Mass., are the Best in the World for Boiler Feeding and other purposes.

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OFFICE & WORKS:
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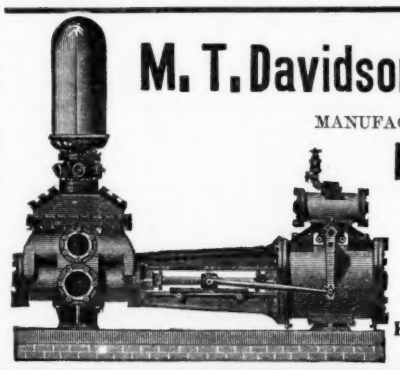
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WESTON'S PATENTS. ANY CAPACITY.
Can be operated by Hand or Power.
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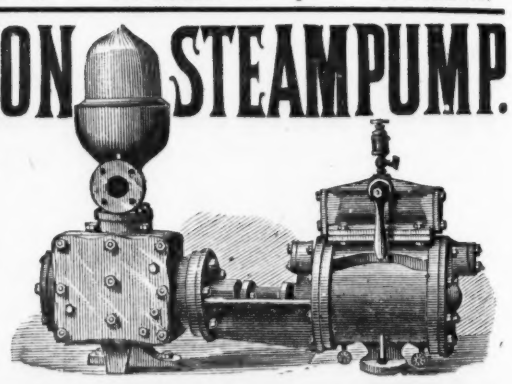

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guaranteed to excavate 50 per cent. more material from hard bottom than any other machine.
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Has proved very efficient and desirable in the hardest hard-pan. Derrick lifts 8 tons. Circulars furnished.
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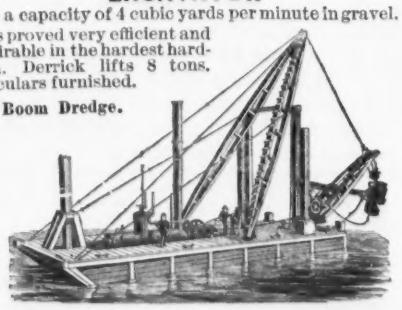
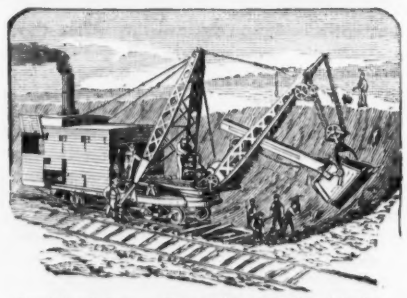
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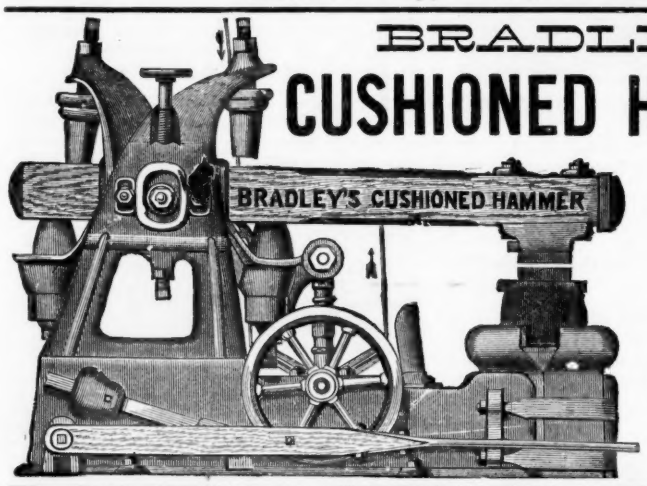

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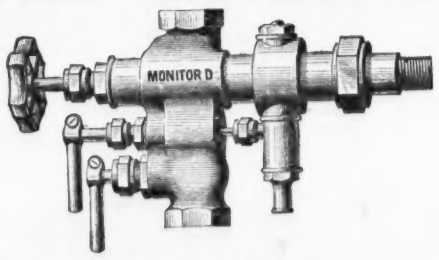

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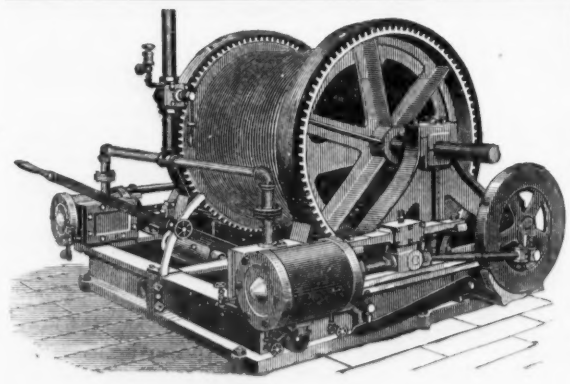

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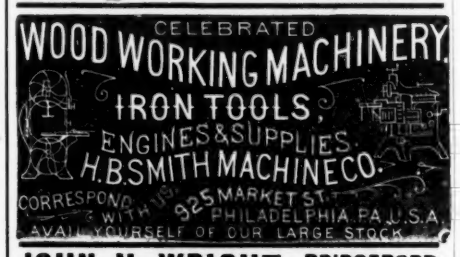

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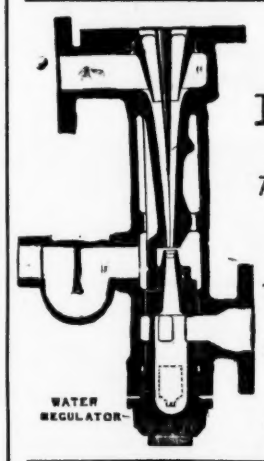

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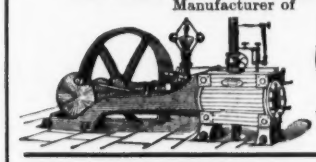

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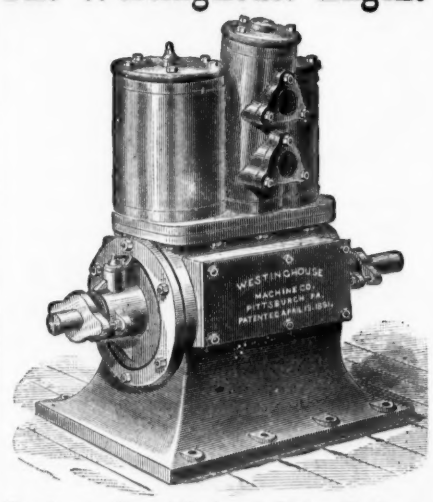

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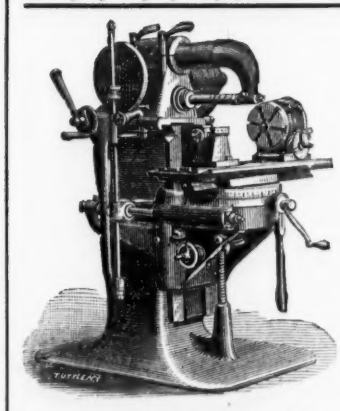

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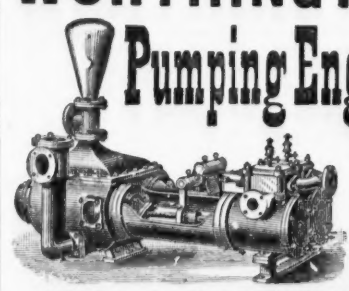

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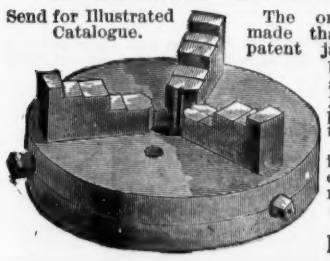

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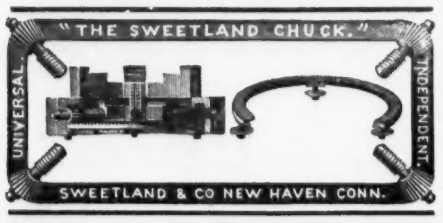

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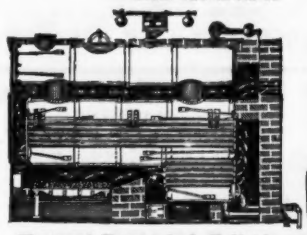

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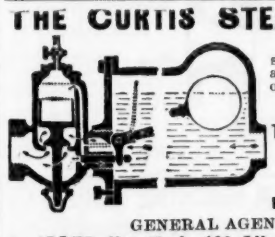

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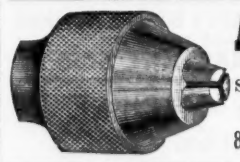

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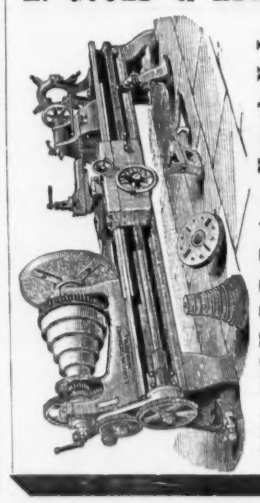

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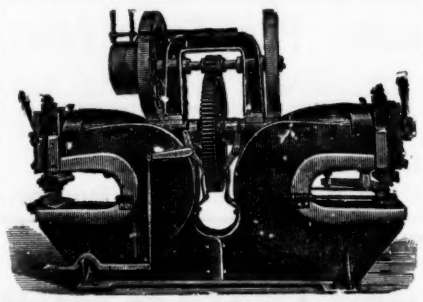

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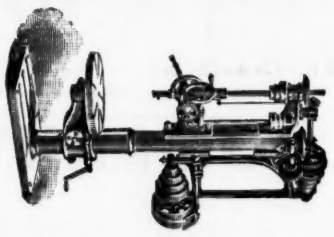

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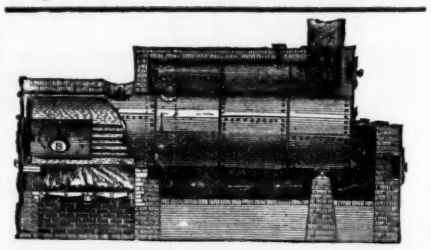

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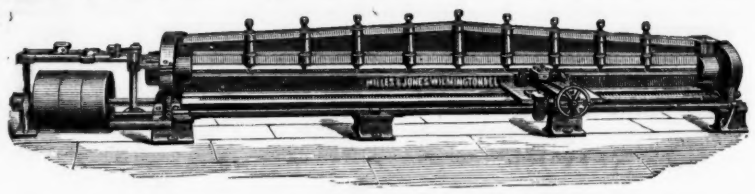

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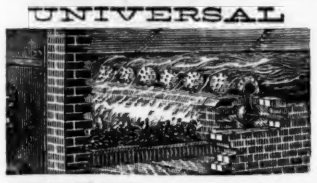

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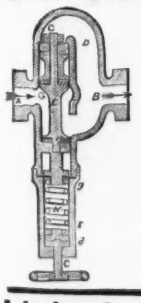

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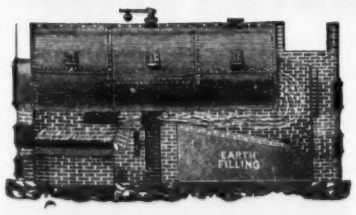

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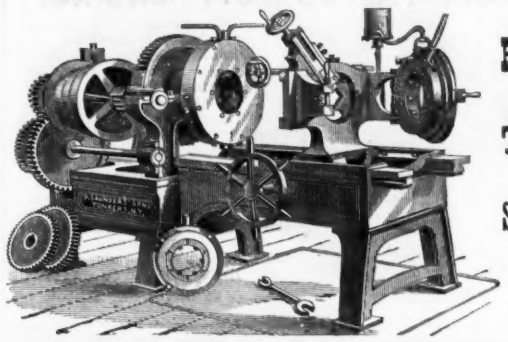

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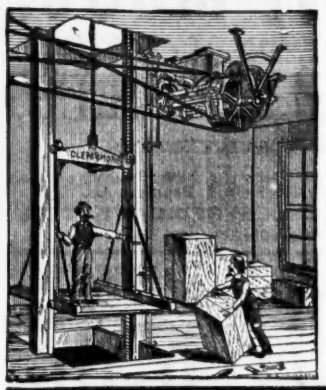

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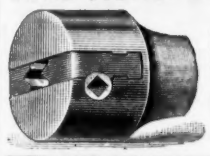

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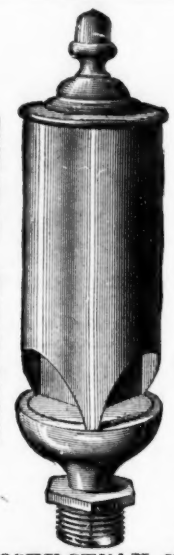

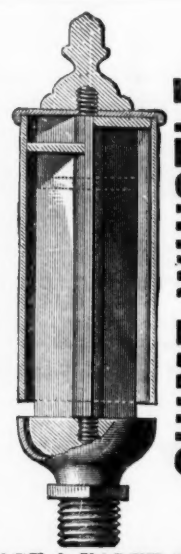

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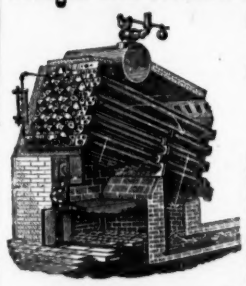

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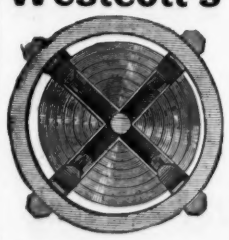

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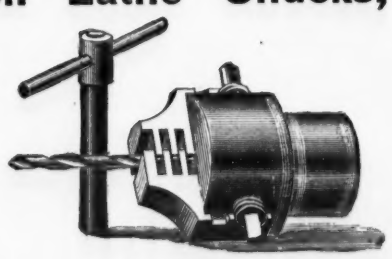

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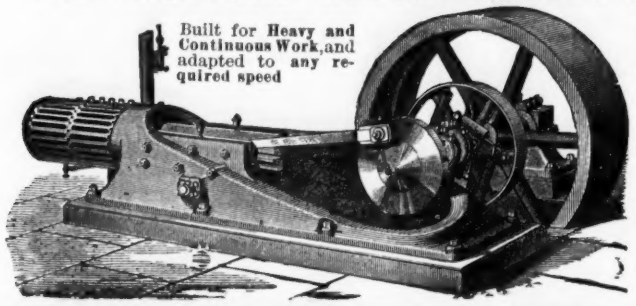

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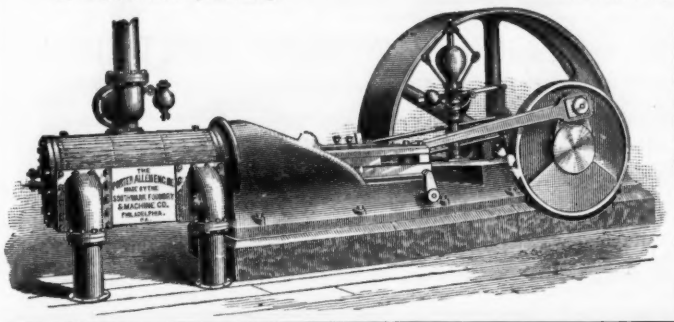

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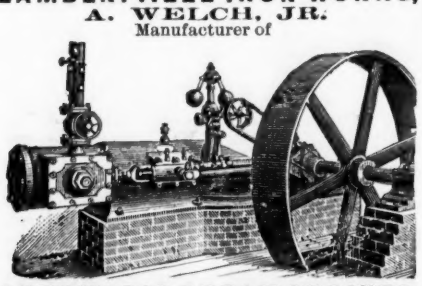

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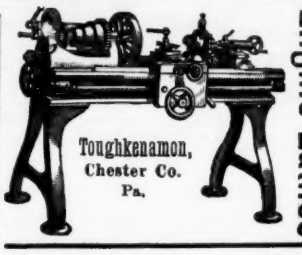

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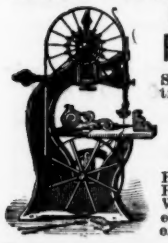

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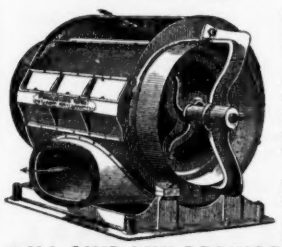

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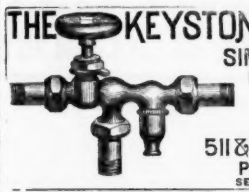

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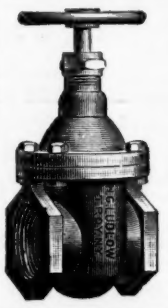

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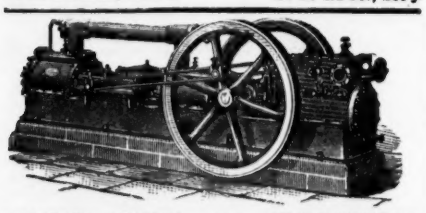

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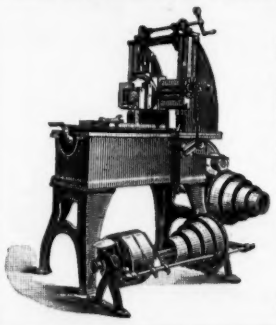

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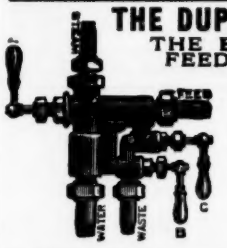

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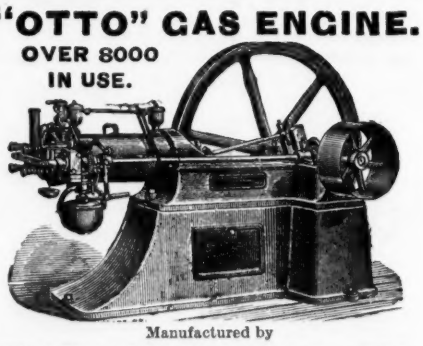

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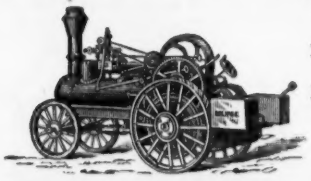

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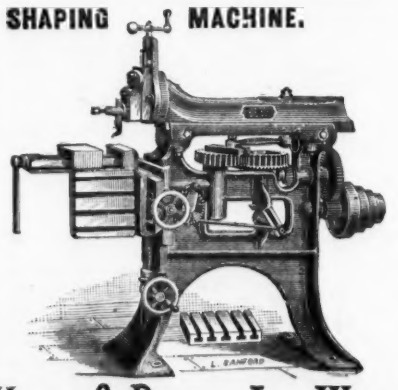

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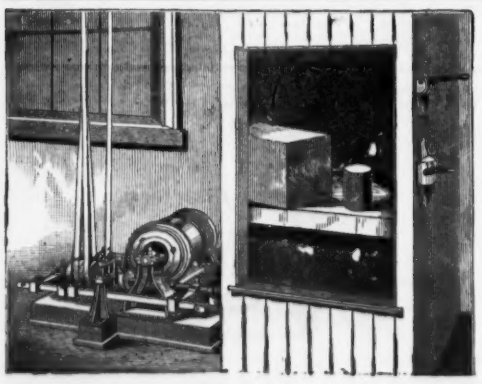

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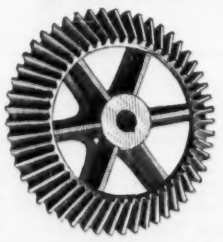

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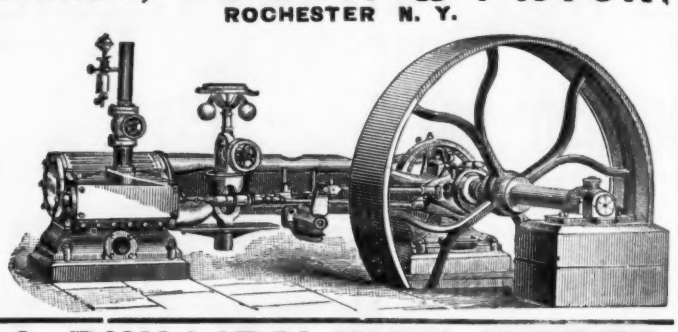

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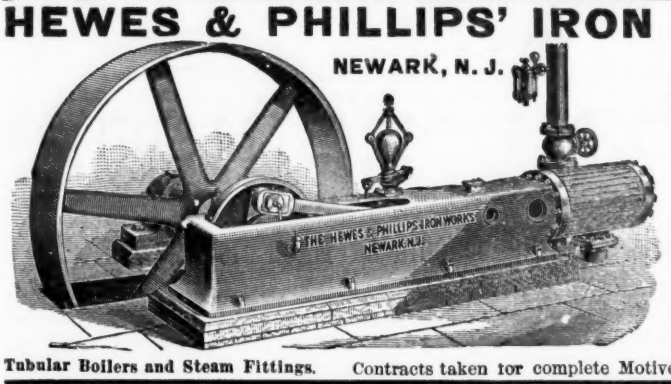

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On Hand or for Quick Delivery. *Write for prices and particulars.*

ENGINE LATHES.

38 inch, triple-geared (bed to suit).			Fitchburg.
28 inch swing,		18 foot bed.	Fitchburg.
26 " "	18 "		Fitchburg.
24 " "	14 and 16 "		Fitchburg.
21 " "	12 and 14 "		Blaisdell.
20 " "	14 "		Fitchburg.
20 " "	12 "		Fifield.
19 " "	10 and 12 "		Gray.
18 " "	10 and 12 "		Blaisdell.
17 " "	6 "		Johnson.
16 " "	6 and 8 "		Fitchburg.
14 " "	6 and 8 "		Fitchburg.
13 " "	8 "		Blaisdell.

PLANERS AND SHAPERS.

30 inch x 30 inch x 8 foot,	Fitchburg.
25 inch x 25 inch x 8 foot,	Fitchburg.
36 inch x 36 inch x 9 ft., planer, 2d hand, good order.	Wheeler.
26 inch x 24 inch x 6 and 7 ft. planer,	Wheeler.
22 inch x 20 inch x 4 ft. planer,	Wheeler.
18 inch x 18 inch x 3 foot planer,	Gould.
10 inch stroke shaper,	Fitchburg.
15 inch stroke crank planer,	Blaisdell.
10 inch stroke shaper,	Gould.
12 inch stroke shaper,	Fitchburg.
15 inch stroke shaper.	Gould & Eberhardt.

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48 inch radial drill, self-feed, double gearing slotted and planed bed.	Betts.
30 inch, back-geared, automatic.	Prentice.
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25 inch, quick return.	Blaisdell.
19 inch, " "	Blaisdell.
18 inch, " "	Blaisdell & Fitchburg.

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American Tool Machine Co's.

No. 2 Cabinet Turret Lathes, 6 ft. bed, 18 in. swing.
No. 1 Sq. Arbor Fox Lathe, 5 ft. bed, 15 in. swing.
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Sq. Arbor Fox Lathe, Gage.

2, 3, and 4 spindle drills,	Garvin.
15 inch swing, 5 foot bed, Fox Lathe,	Gage.
No. 2 (⅛-1¼) Bolt Cuttters,	Merrimans.
Power and Hand Millers,	Garvin.
12 inch slotter (swing 56 inch),	Hewes & Phillips.

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40 inch Swing,	14 foot Bed,	Engine Lathe.		New.	
36 "	18 "	"		"	
36 "	12 "	"		"	
34 "	9 "	"		"	
24 "	12 "	"		"	
20 "	10 "	"		"	
20 "	6 "	"		"	
18 "	10 "	"		"	
18 "	8 "	"		"	
18 "	6 "	"		"	
16 "	6 "	"		"	

Also lot of Second-hand Lathes.

38 inch x 38 inch x 12 foot	Iron Planer.					New.		
38 "	38 "	"	8	"	"	"	"	
36 "	36 "	"	11	"	"	"	"	
36 "	36 "	"	9	"	"	"	"	
32 "	32 "	"	9	"	"	"	"	
27 "	27 "	"	7	"	"	"	"	
30 "	27 "	"	10	"	"	"	"	

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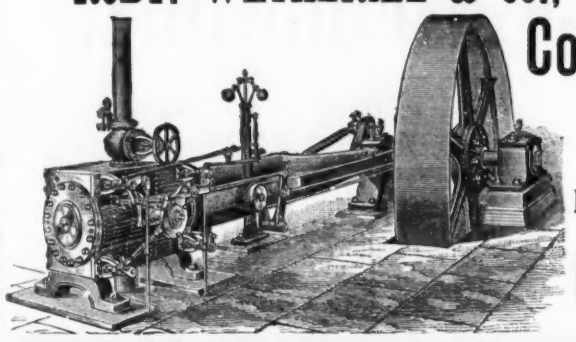

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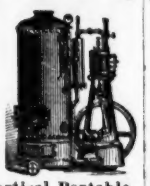

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WORCESTER, MASS.

New & Second-Hand Machinery.

OCT. 17, 1882.

1	Engine Lathe,	14 in. x 5, 6 & 7 ft.	Grant & Bogert.
1	" "	42 in. x 14 ft. New.	[New.
1	" "	26 in. x 14 ft.	Grant & Bogert.
1	" "	36 in. x 12, 17 ft.	New.
1	" "	44 in. x 14 ft.	Good order.
1	" "	32 in. x 8 ft. " "	
1	" "	21 in. x 7 ft. " "	Pond.
1	" "	14 in. x 6 ft.	Star Tool Co. New.
1	" "	15 in. x 6 ft.	"
1	" "	14 in. x 5 x 6 ft.	"
1	" "	16 in. x 6, 7 & 8 ft.	Bridgeport. "
1	" "	13 in. x 5 ft & 6 ft.	Ames. "
1	" "	16 in. x6, 7 & 8 ft.	Ames. "
1	" "	18 in.x8 & 10 ft.	Lodge & Barker "
1	" "	24 in. x 12 ft.	Perkins "
1	" "	22 in. x 10 ft.	Fifield. New.
1	" "	28 in. x 16 ft.	New. Fifield.
1	" "	11 in. x 4 ft. & 5 ft.	Prentiss. New.
1	" "	11 in. x 4 ft.	New.
1	" "	12 in. x 5 ft.	Young. New.
1	Plain Engine Lathe,	16 in. x 4 ft.	"
1	" " "	13 in. x 4 ft.	Good ord. P. & W. Co.
1	" " "	15 in. x 4 ft.	New.
1	Fox Lathe,	15 in. x 5 ft.	Am. Tool & Machine Co.
1	15 in. x 4 ft.	Turret Lathe.	Lodge & Barker.
1	Planer,	48 in. x 48 in. x 12 ft.	New.
1	"	38 in. x 38 in. x 8 ft.	"
1	"	36 in. x 36 in. x 18 ft.	"
1	"	36 in. x 36 in. x 6 ft.	Good order.
1	"	16 in. x 14 in. x 3½ ft.	New.
1	"	22 in. x 20 in. x 5 ft.	"
1	"	24 in. x 24 in. x 6 ft.	Hendey. new
1	"	26 in. x 26 in. x 7 ft.	
1	"	20 in. x 20 in. x 4 ft.	Good order.
1	16 in.	Upright Drill.	"
1	20 in.	Upright Drill.	Prentiss. "
1	24 in.	"	Prentiss. "
1	30 in.	"	" "
1	25 in.	swing B.G. & S. F.	Drill. Blaisdell. "
1	28 in.	" "	" " "
1	15 in.	Shaper.	Gould & Eberhart. "
1	15 in.	Shaper.	Hendey. "
1	24 in.	Shaper,	Hendey. "
1	9 in.	Shaper	Hewes & Phillips. "

Full assortment Milling Machines, Spindle Drills, &c., of Garvin's. New.

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One Gleason, Triple Geared, Screw-Cutting Engine Lathe, 40 inch swing, 16 foot bed.

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One Special Shafting Lathe, 28 inch swing, 25 foot bed, to take 20 feet between centers.

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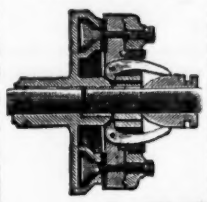

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The following New and Improved Machinists Tools are part of what we have for early delivery

1	30 in. Swing,	18 ft. bed.	New Engine Lathe.		Oct 5.
1	30 in. "	16 ft. "	" "	"	Oct 20
1	30 in. "	14 ft. "	" "	"	Oct 10
1	26 in. swing,	14 ft. bed.	Oct, 20th.		
1	32 in. x 8 ft.	Planers.	New. Oct. 10th.		
2	12 in. stroke	Slotting Machines.	New. Oct. 10.		

The following on hand:

1	42 in. swing,	16 ft. bed,	New Engine Lathe.		
1	New Corliss Engine.	12″ x 36″.	Complete.		
2	22 in. "	12 ft.	" "		
2	18 in. "	8 ft.	" "	"	
1	17 in. "	10 ft.	" "		
5	15 in. "	6 ft.	" "	"	
1	12 in. swing,	6 ft.	Hand Lathe. New.		
1	10 in. "	4½ ft.	Bed Hand Lathe. New.		
1	38 in. x 10 ft.	Planer.	New.		
1	38 in. x 12 ft.	Planer.	New.		
2	30 in. x 8 ft.	Planers.	New.		
2	22 in. x 4 ft.	Planer.	New.		
2	38 in.	Swing Upright Drills.	B. G. & S. F. New.		
1	26 in.	Drill.	B.G.&S.F. New.		
1	23 in.	Drill.	B. G. & S. F. New.		
1	23 in.	"	Plain.		
3	20 in.	"	"		
1	18 in.	Bench Drill.			
1	4 spindle	Drill.	New.		
1	3 "	"	"		
2	4 "	"	Second-hand.		
1	Wall Drill,	heavy.	Second-hand.	60 in	
2	12 in.	Shapers.	New.		
2	15 in.	"	"		

2 12 in stroke Shapers, traveling head, 40 in traverse double tables. New.
3 Wood's Patent Bolt Cutting Machines to cut from ⅛ in to 2 in inclusive. New.
1 Sellers Milling Machine. 2d-hand.
1 Face Milling Machine. Second-hand.
1 Pond's Double Milling Machine. 2d-hand.
1 No. 1 Screw Machine. Brown & Sharpe. 2d-hand
1 Screw Head Slotter. Second-hand.
2 Second-hand Profiling Machines
2 4½ in Hyde's Patent Centering Machines. New.
1 Emery Grinder, 2d-hand, for 10 in. Wheels.
1 Bolt Pointing Machine. Second-hand.
1 Double Nut Tapper. New Horizontal.
3 Double-Acting Presses, No. 3, nearly new.
4 Single-Acting Presses, for power, "
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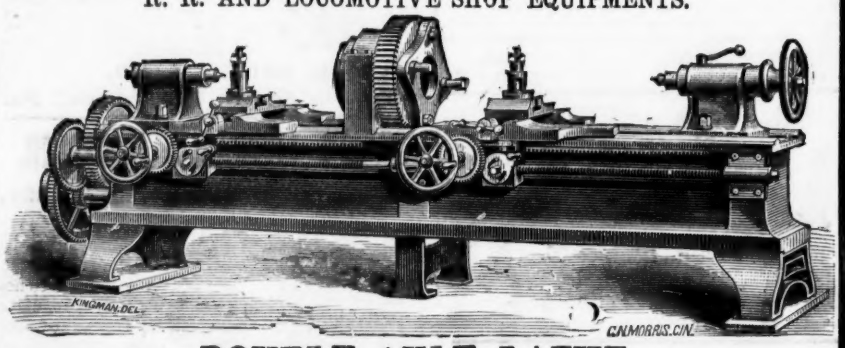

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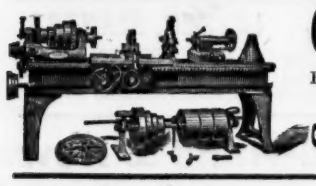

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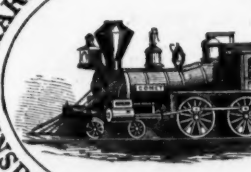

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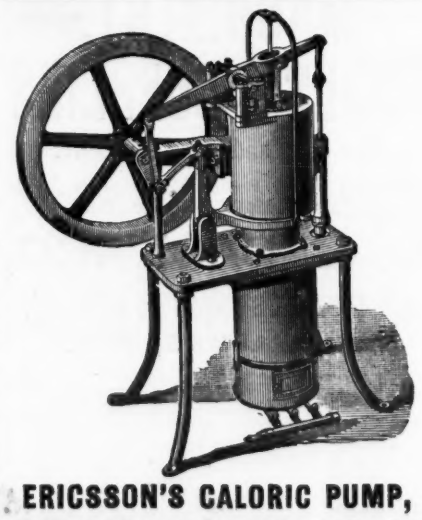

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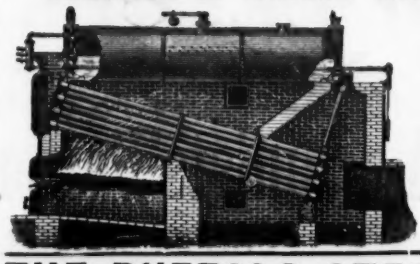

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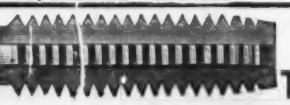

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